Working Papers on Language Universals
No. 15, November 1974
pp. 25-140

OBJECT-VERB AGREEMENT*

Edith A. Moravcsik
Language Universals Project
Stanford University

ABSTRACT

Some crosslinguistically valid observations about verb agreement patterns are presented, especially as related to the agreement of the verb and the direct object. Questions about the relationship of these statements to observable linguistic reality, about their significance, and about their explanations are raised. By examining various interpretable and non-interpretable representations of sentences with object-verb agreement, it is concluded that agreement is not an immediately observable relation, and the traditional concept of it being an abstract syntactic phenomenon is reconfirmed by proposing a corresponding formal characterization. The significance of verb agreement as an abstract construct is suggested by showing that it is sufficient to facilitate general explanations for sentential sound-meaning correspondences. Substantive and inferential principles are provided and discussed to account for the derivational relationship of verb agreement representations to interpretable phonetic and semantic representations and the use of these principles for proving linguistically significant theorems is illustrated.

---

*I am grateful to faculty and student linguists at the University of California in Los Angeles who contributed, directly or indirectly, to the writing of this paper.

TABLE OF CONTENTS

Abstract 25
1. Introduction 27
1.1. Some observations 27
1.2. Assumptions and hypotheses about grammars 45
2. The description of object-verb agreement 70
2.1. Prelexical representation 70
2.2. Terminal semantic representation 87
2.3. Syntactic rules 106
2.4. Rule application 114
2.5. A fragment of a universal grammar 125
3. Conclusions 135
References 138

1. Introduction

1.1. Some observations

The basic observation that this study is concerned with is that in some languages some direct objects are in grammatical agreement relationship with their verbs.

The terms "verb", "direct object", "agreement", and other grammatical terms to be mentioned later will be used in their traditional sense, unless noted otherwise. The traditional sense of the term "agreement" is understood to specify agreement as a phenomenon of systematic cross-sentential covariance between some meaning-related property of one constituent and some form-related property of another. In the case of object-verb agreement, the agreeing constituent is the verb and the agreed-with constituent is the direct object, in that depending on whether the object is of one grammatical gender or of another, of one grammatical person or of another, whether it is in the singular or in the plural, or whether it is definite or indefinite, a clitic or an affix formally associated with the verb will have one or another shape.

Object-verb agreement is exemplified below by sentences of LEBANESE ARABIC (the object agreement markers are underlined):

samiir šaafu la l walad	"Samir saw(-he)-him objectcasemarker the boy" 'Samir saw the boy.'
samiir šaafha la l bint	"Samir saw(-he)-her objectcasemarker the girl" 'Samir saw the girl.'
samiir šaafni ili	"Samir saw(-he)-me me" 'Samir saw me.',

where all other combinations of the given verbs and objects such as samiir šaafha la l walad, are ungrammatical (Koutsoudas 1967; 1969, 67-71).

The general observation that in some languages some direct objects are in agreement relationship with their verb can be made more specific both in respect to the relevant kinds of objects and relevant kinds of languages involved and in respect to the semantic and formal nature of the agreement marker. In particular, there are seven further observations that data from my sample of languages have been found to be consistent with and which serve to make the above statement more specific.

1. The non-null set of agreed-with terms of any language includes some or all subjects; or, in other words, if in a language the verb agrees with anything, it agrees with some or all subjects.

2. The non-null set of agreeing non-subjects of any language includes some or all direct objects; or, in other words, if in a language the verb agrees with anything other than subjects, it agrees with some or all direct objects.

3. The non-null set of agreeing constituents in a language which are neither subjects nor direct objects includes some or all indirect objects; or, in other words, if in a language the verb agrees with anything other than subjects and direct objects, it agrees with some or all indirect objects.

4. The non-null set of those members of any major sentence constituent class that the verb agrees with includes some or all definite[1] members of that constituent class; or, in other words, if there is agreement with any subjects, or any direct objects, or any indirect objects, or any adverbials, therewill be agreement with some or all definite subjects, some or all definite direct objects, some or all definite indirect objects, and some or all definite adverbials, respectively.

5. The non-null set of those definite or indefinite members of any major sentence constituent class that the verb agrees with includes all preverbal[2] members of that constituent subclass; or, in other words, if there is agreement with any definite or indefinite subjects, or any definite or indefinite direct objects, or any definite or indefinite indirect objects, or any definite or indefinite adverbials, there will be agreement with all preverbal definite or indefinite subjects, all preverbal definite or indefinite direct objects, all preverbal definite or indefinite indirect objects, and all preverbal definite or indefinite adverbials, respectively.

---

[1] The term "definite" will have to be understood not as "semantically definite", but as "either semantically definite or definitely marked"--i.e. to refer to members of a class none of which are semantically indefinite and some of which are semantically definite, and where all those members that are not semantically definite are formally marked the same way as the majority of those that are semantically definite. Evidence to indicate that this, but not a purely semantic definition of definiteness, delimits agreement-significant nominal classes comes from HUNGARIAN and MODERN GREEK. In HUNGARIAN, nominals are semantically either definite or indefinite or generic. Formally, nouns are either preceded by one article, or by another article, or by no article. Most (but not all) semantically definite nouns take one of the two articles (and never the other), and most (but not all) semantically indefinite nouns take the other article (but never the first). Semantically generic nouns take (corresponding to a subtle meaning difference that I cannot make explicit)

6. Direct object agreement markers are always formally distinct from subject agreement markers, indirect object agreement markers, and adverbial agreement markers, but of these they tend to be the least similar to subject agreement markers. In all languages where they occur, they may cooccur within the same simple sentence with subject agreement markers. With indirect object agreement markers they may cooccur in some languages and they may not in others. The subject agreement marker is generally but not always linearly intermediate between the object marker and the verb.

(Footnote 1 continued)
either the article that most semantically definite nouns take, or they take the article that most semantically indefinite nouns do, or they take no article. There are two verb-conjugational paradigms, of which semantically definite objects consistently require one whereas semantically indefinite objects consistently require the other. If the object is generic, the verb occurs in one or the other paradigm depending on the article of the generic object: if it is the definite article, the verb occurs in the paradigm that it occurs in when the object is semantically definite and if it is indefinite, or if there is no article, it takes the suffixes that it takes when the object is semantically indefinite. Compare for instance:

az almát látom
"the apple-accusative see-I-definiteobject"
'I see the apple.'

egy almát látok
"an apple-accusative see-I-indefiniteobject"
'I see an apple.'

szeretem az almát
"like-I-definiteobject the apple-accusative"
'I like apples.'

almát szeretek
"apple-accusative like-I-indefinite object"
'I like apples.'

In MODERN GREEK, where the general semantic and formal classification of nominals from the point of view of definiteness appears to be similar to that in HUNGARIAN, the verb agrees with a definitely marked generic direct object as it would with a semantically definite direct object (Drachman 1970, 23).

[2] "Preverbal" means either "immediately preverbal" or "non-immediately preverbal."

7. The object agreement marker in all languages where it exists bears a significant relationship to some personal pronouns of that language which is both formal and semantic, in that the object agreement marker is always significantly similar in phonological form to a personal pronoun and can always be used to signify by itself the meaning of some personal pronominal object complement of the verb.

The first five of these statements are concerned with the agreed-with terms involved in verb agreement in general and the sixth and the seventh with the agreement marker involved in object-verb agreement. Of the five statements pertaining to agreed-with terms, the first three allow for specific predictions concerning the non-occurrence and co-occurrence of various agreement patterns in languages in terms of the major constituent type of the agreed-with nominal and the fourth and fifth statements allow for similar predictions in terms of two further properties of the agreed-with nominal.

The first three statements jointly provide for a characterization of sets of actually occuring and actually non-occurring language types, by excluding eleven out of sixteen logically possible types whose occurrence would be predicted on the assumption that the four language properties "having subject agreement", "having direct object agreement", "having indirect object agreement", and "having adverbial agreement" are independent and thus freely combinable within linguistic systems. The eleven language types ruled out are those that would have any lower constituent agreement without having agreement with at least some members of all higher constituents, where "lower" and "higher" refer to relative positions on the scale "adverbial, indirect object, direct object, subject". The five possible types include the four types where if the verb agrees with at least some members of a lower constituent, it also agrees with some or all members of all higher constituents and it includes the type without agreement. The following list shows the sixteen possible types, with the excluded ones crossed out (S = subject agreement, O = direct object agreement, I = indirect object agreement, A = adverbial agreement): S; Ø; I; A; SO; SI; SA; ØI; ØA; IA; SOI; SØA; SIA; ØIA; SOIA; no agreement. The five existing types can be exemplified as follows:

a. languages that have verb agreement with some or all subjects, some or all direct objects, some or all indirect objects, and some or all adverbials--e.g. AMHARIC

b. languages that have verb agreement with some or all subjects, some or all direct objects, some or all indirect objects, but with no adverbials--e.g. LEBANESE ARABIC, MODERN GREEK, SYRIAN ARABIC, SPANISH, SWAHILI, ZULU

c. languages that have verb agreement with some or all subjects and some or all direct objects[3], but with no indirect objects or adverbials--e.g. HUNGARIAN[4]

d. languages that have verb agreement with some or all subjects, but with no direct objects, indirect objects, or adverbials--e.g. ENGLISH

e. languages that have no agreement--e.g. CHINESE.

The fourth and fifth statements jointly provide for a further delimitation of occurring and non-occurring language types, by stating that the property "definiteness" and the property "preverbality" define further agreement-significant subclasses of all major constituents. In particular, they exclude nine out of the fifteen possible agreement patterns with respect to the agreement of members of each major constituent class which patterns would all be predicted to exist on the assumption that verb agreement with all preverbal definite members, with some or all postverbal definite members, with all preverbal indefinite members, and with some or all postverbal indefinite members are independent subpatterns and thus freely combinable within linguistic systems. What the excluded

---

[3] Apart from languages mentioned in a., b., and c., for which I have more extensive primary data, I know of some object-verb agreement also in the following languages: AKKADIAN, ALBANIAN, CHEROKEE, CHINOOK, CHIPPEWA, FIJIAN, HADSA, IROQUOIS, KAROK, KIKUYU, MACEDONIAN, MEZQUITAL OTOMI, MODERN SYRIAC, MOHAWK, NAHUATL, OSTYAK, QUECHUA, RUMANIAN, SAMOYEDIC (NENETS, SELKUP), SQUAMISH, TIGRE, VOGUL, YUCATEC MAYAN, YUROK, WALBIRI.

[4] HUNGARIAN actually has agreement with all other kinds of complements as well, but such agreement is optional and the resulting sentences are stylistically somewhat restricted. Compare the following:

Jánosnak-adta a könyvet	"John-to-gave the book" / 'He gave the book to John'
Jánosnak odaadta a könyvet	"John-to there-gave the book"
Jánosnak nekiadta a könyvet	"John-to to-him-gave the book"
árokbafordult az autó	"ditch-into-turned the car" / 'The car turned into a ditch.'
az árokba befordult az autó	"the ditch-into into-turned the car"
az árokba belefordult az autó	"the ditch-into into-it-turned the car".

patterns all have in common is that they involve agreement with indefinite but not with definite nominals, or agreement with postverbal but no preverbal nominals, or they involve agreement of both of these kinds. In all of the predicted patterns this is not the case. Here are the fifteen logically possible combinations, with the excluded ones marked appropriately (DPr = having verb agreement with all definite preverbal members of a constituent, DPo = having verb agreement with some or all definite postverbal members of a constituent, IPr = having verb agreement with all indefinite preverbal members of a constituent, IPo = having verb agreement with some or all indefinite postverbal members of a constituent): DPr; ~~DPo~~; ~~IPr~~; ~~IPo~~; DPr, DPo; DPr, IPr; ~~DPr, IPo~~; ~~DPo, IPr~~; ~~DPo, IPo~~; ~~IPr, IPo~~; DPr, DPo, IPr; ~~DPr, DPo, IPo~~; DPr, IPr, IPo; DPo, ~~IPr, IPo~~; Dpr, DPo, IPr, IPo. The predicted patterns are thus the following:

a. agreement with all preverbal definite members only

b. agreement with all preverbal and some or all postverbal definite members only

c. agreement with all preverbal definite and indefinite members only

d. agreement with all preverbal definite and indefinite members and with some or all postverbal definite members

e. agreement with all preverbal definite and indefinite members and with some or all postverbal indefinite members

f. agreement with all preverbal definite and indefinite and with some or all postverbal definite and indefinite members.

This means that of the four previously identified existing language types that have agreement, for subject-agreement languages, of the logically possible fifteen subtypes six are predicted and nine excluded; for subject-direct-object-agreement languages, since here each of the fifteen logically possible subject agreement patterns could in principle occur as combined with each of the fifteen logically possible direct object agreement patterns, out of 15 x 15 = 225 logically possible subtypes 6 x 6 = 36 are predicted and 189 excluded; for subject-direct-object indirect-object-agreement languages, out of the 15 x 15 x 15 = 3375 logically possible subtypes 6 x 6 x 6 = 216 are predicted and 3159 types excluded; and for subject-direct-object-indirect-object-adverbial agreement languages out of the 15 x 15 x 15 x 15 = 50625 logically possible language types 6 x 6 x 6 x 6 = 1296 types are predicted and 49329 types excluded.

Although all evidence that I have is consistent with these predictions, I can actually illustrate only very few of the predicted types. These are the following:

A. subject-agreement languages:

A.a. agreement with all preverbal definite and indefinite and some postverbal (indefinite) subjects: ENGLISH

B. subject-direct-object-agreement languages:

B.a. agreement with all preverbal and postverbal definite and indefinite subjects and with all preverbal and postverbal definite direct objects; but with no indefinite objects: HUNGARIAN

C. subject-direct-object-indirect-object-agreement languages:

C.a. agreement with all (?) preverbal and postverbal definite and indefinite subjects and with all definite preverbal and some definite postverbal direct and indirect objects; but with no indefinite direct and indirect objects: LEBANESE ARABIC[5], MODERN GREEK, SPANISH, ZULU

C.b. agreement with all preverbal definite and indefinite subjects and with some postverbal definite and indefinite subjects and with all preverbal definite and some postverbal definite direct and indirect objects; but with no indefinite direct or indirect objects: SYRIAN ARABIC

C.c. agreement with all preverbal definite and indefinite and with some postverbal subjects (?), direct objects, and indirect objects: SWAHILI

D. subject-direct-object-indirect-object-adverbial-agreement languages:

D.a. agreement with all preverbal and postverbal definite and indefinite subjects and with all preverbal definite direct objects, indirect objects, and adverbials; but with no postverbal or indefinite ones: AMHARIC.

This small language sample thus justifies the claimed agreement-significance for all major constituent classes for definiteness in relation to subjects and direct and indirect objects and for preverbality in relation to definite and indefinite subjects[6] and to definite direct objects, indirect

---

[5] Some dialects of LEBANESE ARABIC, that is; since Koutsoudas notes that there are speakers who accept agreement with objects that have an indefinite article (Koutsoudas 1967, 37, footnote).

[6] Evidence to indicate the agreement-significance of definiteness and preverbality with respect to subjects comes from ENGLISH and from SYRIAN ARABIC. In SYRIAN ARABIC, the verb agrees both with subjects that are definite and that are indefinite and both with preverbal and postverbal ones; but whereas all preverbal subjects, definite or indefinite, are agreed with, only some postverbal ones are agreed with; and

objects, and adverbials. It does not justify claiming agreement-significance for definiteness in relation to adverbials and for preverbality in relation to indefinite direct objects, indirect objects, and adverbials.[7]

Let us now assess the actual significance of these five statements for the universal predictability of the occurrence of various verb agreement patterns. The occurrence of verb agreement would be universally fully predictable if, for any sentence in any language, there were some principle such that from the conjunction of that principle and of some set of properties of the sentence, we could tell whether the verb will agree with any constituent and if yes, with which ones. These statements do contribute to this goal by indicating that of all the possible sentence properties from which agreement might in principle be predictable what is in fact relevant for such predictions is certain properties of the nominal constituents of the sentence--in particular, their membership in major sentence constituent classes, their definiteness, and their linear position in relation to the verb. The range of predictions, however, is much narrower than the total range of predictions desired. In particular, the statements fall short of rendering the occurrence of verb agreement patterns universally predictable for the following reasons:

a. for the prediction of the occurrence of subject agreement in a language the conditions given are sufficient but not necessary

b. for the prediction of direct object and indirect object agreement in a language some of the conditions given are necessary and others sufficient but none both

c. for the prediction of adverbial agreement the conditions given are necessary but not sufficient

---

(Footnote 6 continued)
of the postverbal subjects it is more common for the verb not to agree with indefinite ones than for it not to agree with definite ones (Cowell 1964, 407-412, 421-423; compare also Anschen and Schreiber 1968). In ENGLISH, verbs agree with all preverbal subjects, but they don't always agree with postverbal (and thus, by necessity in this language) indefinite subjects; compare There was a man and a woman in the room. as opposed to A man and a woman were (*was) in the room. (Morgan 1972).

[7] A bit of non-primary evidence possibly indicating that preverbality is an agreement-significant property of indefinite objects comes from Blanc (1964, 130), who notes that in the ARABIC dialects of Central Asia the verb appears to agree with both definite and indefinite objects and that objects are generally preverbal.

d. for predicting agreement with definite and with preverbal nominals, the conditions given are only sufficient but not necessary

e. for predicting agreement with indefinite and with postverbal nominals, the conditions given are only necessary but not sufficient

f. for predicting that a particular given constituent of a given sentence of a language will be agreed with or not the conditions given are only necessary but not sufficient.

In particular, note first that whereas some prediction is made concerning which languages will have some subject agreement, the statement does not enable us to determine the total set of languages with subject agreement but only a subset of them--the set of those languages where subject agreement cooccurs with some other type of agreement. Thus subject agreement is predicted for languages that also have some other type of agreement; but the option of having or not having subject agreement is left open for those languages that do not have any other kind of agreement. In other words, all that is given for subject agreement languages is a language class that is included in it. Similarly, the class of languages that have agreement with definite constituent members and the class of languages that have agreement with preverbal constituent members are also overcharacterized in terms of an included set which is, for the former, those languages that have agreement with indefinite nominals, and, for the latter, those languages that have agreement with postverbal nominals.

Note, on the other hand, that for the identification of the set of languages that have adverbial agreement, only a necessary condition is provided: all such languages have to have agreement with higher constituents. But since not all such languages have adverbial agreement, the set of all adverbial-agreement languages remains uncharacterized. The same also holds for languages with indefinite and postverbal nominal agreement.

Note, thirdly, that the account similarly fails to define the total set of languages with direct and indirect object agreement. In particular, we know that the set of all direct object agreement languages will be included in the set of subject agreement languages and that it will include the set of indirect object agreement languages; and we know that the set of indirect object agreement languages will be included in the set of direct object agreement languages and it will include the set of adverbial agreement languages; but the including sets may underspecify and the included sets may overspecify the sets in question; in particular, the statements leave open as to whether languages with subject agreement and without indirect object agreement will or will not have direct object

agreement; and as to whether languages with direct object agreement and without adverbial agreement will or will not have indirect object agreement.

Fourthly, note that even if we know that a language has agreement with a particular class of constituents, we cannot tell, given a particular sentence of that language, whether the verb will or will not agree with the direct object in it. This is because the statements were formulated to make predictions about some or all members of a constituent type or subtype, or, in the case of preverbal nominals, about all members; rather than about all members of a class and only those. For instance, we are told that if in a language there is verb agreement with any direct object, there will be verb agreement with some or all definite direct objects (but, possibly, with some indefinite ones as well); rather than being told that if in a language there is agreement with less than all direct objects, there will be agreement with all definite direct objects and only with those. Similarly, we are told that if in a language there is verb agreement with any definite direct object, there will be agreement with all preverbal definite direct objects (and, possibly, with some postverbal ones), rather than being told that there will be agreement with all preverbal definite direct objects and only those. In other words, for deciding whether a given verb in a given sentence of a given language will or will not agree with a given nominal, the major constituent class membership of the nominal and its definiteness provide neither necessary nor sufficient grounds, and linear precedence in respect to the verb is only sufficient but not necessary for that nominal to be agreed-with.

The reason why our statements have been formulated in this manner is that the nature of my data in fact did not allow for a crosslinguistically valid more predictive formulation, even though for some individual languages a more restrictive formulation would hold true. Thus, for instance, in HUNGARIAN, which is a subject-object-agreement language, verbs agree, in addition to objects, with all subjects and only those. Also in HUNGARIAN, as far as objects are concerned, verbs agree with all and only definite objects. And in AMHARIC, a four-constituent-agreement language, verbs agree with all and only preverbal constituents. Definiteness, on the other hand, is only a necessary but not a sufficient property of agreed-with objects in LEBANESE ARABIC, MODERN GREEK, SPANISH, and ZULU and it is neither a necessary nor a sufficient property of agreed-with objects in SWAHILI; and preverbality is sufficient but not necessary for objects to agree in LEBANESE ARABIC, MODERN GREEK, SPANISH, ZULU, and SWAHILI.

The necessity and insufficiency of the definiteness of objects and the sufficiency but non-necessity of the preverbal position of objects to guarantee verb agreement is shown by the following observations about the languages mentioned above. In LEBANESE ARABIC, the verb can only agree with definite objects (but compare footnote 5) but it does not agree with all such objects; it has to agree with all preverbal definite direct objects, but it agrees not only with such objects but also with postverbal ones, optionally if that postverbal object is indirect, and obligatorily if that postverbal object is a direct object provided with the indirect object's case marker or if it is a pronominal direct object (Koutsoudas 1967). In MODERN GREEK, again, the verb agrees only with definite objects but not with all of them; it agrees with all preverbal definite direct objects, but not only with such; in particular, it may optionally agree with postverbal ones as well (Drachman 1970). In SPANISH, the verb agrees only with definite objects but not with all of them; with all preverbal definite objects, but not only with such--it may also agree with some postverbal ones subject to a set of diverse semantic conditions (Babcock 1970, 19ff). In ZULU, the verb agrees only with definite objects but not with all of them; it must agree with preverbal definite objects but not only with such--it must also agree with postverbal definite objects if the verb is emphasized and it may agree with such otherwise (Kunene 1973). Finally, in SWAHILI, the verb has to agree with some but not all definite objects and not only with such. In particular, it appears that it has to agree with preverbal definite objects and with human definite objects; the usage with respect to other definite objects and indefinite objects being optional (Loogman 1965, 332ff, Salone 1974).

Since, except for AMHARIC, preverbality is apparently never both necessary and sufficient to define agreeing classes of objects but is only sufficient as has just been illustrated, one naturally wonders whether it would be possible to identify a property which is shared both by all preverbal nominals and also by those postverbal nominals which the verb also agrees with and thus define a class which properly includes the class of preverbal nominals and which thus can be said to be universally necessary and sufficient to characterize agreeing objects. There is some, but at present not sufficient, evidence to indicate that this in fact may be possible.

In particular, there is evidence to indicate that what is common to the class of preverbal objects is that they manifest one of a number of formal ways of expressing an agreement-significant meaning-related

property which may be called discourse-relevance. The facts are the following. Most, but not all, grammars that note that in their language the verb agrees with preverbal nominals also note that these nominals are understood to be either emphatically anaphoric referring back to something that has been mentioned before (e.g. in SPANISH) or emphatically cataphoric (e.g. in AMHARIC; Getatchew 1971, Hetzron 1971), anticipating repeated reference to a nominal. For some of the languages where this is pointed out, it appears that the class of preverbal nominals and the class of discourse-relevant nominals are coextensive--i.e. all nominals that are preverbal are also discourse-relevant and all discourse-relevant nominals are preverbal. This is for instance the case for AMHARIC. Since a priori it is equally possible that an agreement class be defined by a formal property such as linear precedence with respect to the verb, or that it be defined by a meaning-related property such as discourse-relevance, there is no reason in AMHARIC to choose between a positional and a pragmatic characterization of the class of nominals in question. There would be empirical motivation to choose the form-related label if all members of the agreement-significant nominal class were preverbal but not all were also discourse-relevant; and there would be empirical motivation to choose the pragmatic characterization if all agreed-with objects were discourse-relevant but not all were preverbal. As mentioned above in passing, it is not clear that discourse-relevance is the property of any agreeing preverbal nominals at all in some languages, such as LEBANESE ARABIC andMODERN GREEK, since, for LEBANESE ARABIC, Koutsoudas reports that agreeing and not agreeing sentences have "essentially the same meaning" (Koutsoudas 1967, 33); and Drachman calls agreeing and not-agreeing sentences "free alternants" (Drachman 1970, 3). Since, however, discourse-significance is a sufficiently elusive nominal property, especially for linguists focusing their momentary interest on intra-sentential, rather than inter-sentential, regularities, the question as to whether agreeing preverbal nominals or LEBANESE ARABIC and of MODERN GREEK are discourse-relevant or not remains unanswered pending further empirical research. Provided that agreeing preverbal objects indeed turn out to be discourse-relevant, the next question is whether non-preverbal agreeing objects are also discourse-relevant or not. This is again a matter of empirical research but there is some indication that this may be true. This is because, first of all, in some languages such as ZULU (verb-) emphasis is mentioned as the condition under which postverbal objects are agreed with; and because for other languages for which nothing is said about the pragmatic properties

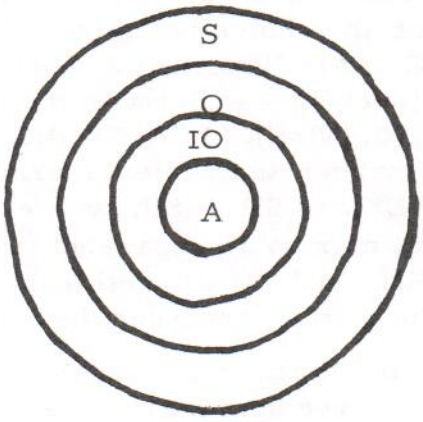
of postverbal agreed-with objects, the formal properties that grammars identify them by--such as pronominality and morphological markedness--make it likely that these nominals would be understood as discourse-relevant in some sense. All in all, the empirical question as to whether the present characterizations of agreed-with definite objects (which are only partly universal, to the extent that such classes universally include the class of preverbal objects) can be replaced by a fully universal, pragmatically based characterization is a possibility whose realization is pending on empirical research.

In conclusion to our discussion of the first five crosslinguistic observations about agreed-with nominals, here are two diagrams representing the claimed inclusion relations with respect to language classes defined on what major sentence constituents the verb agrees with and on which further subclasses of major constituents are agreed with.

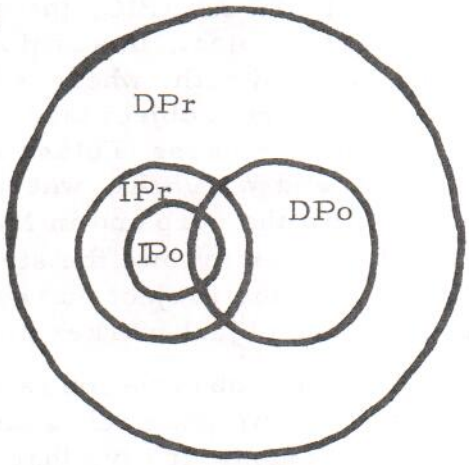
a) The relationship of languages according to what major constituents are agreed-with (S = languages with some subject agreement; O = languages with some direct object agreement; I = languages with some indirect object agreement; A = languages with some adverbial agreement):

b) The relationship of languages according to what subclasses of some given constituent are agreed with (DPr = languages with all definite preverbal members of a constituent; DPo = languages with some definite postverbal members of a constituent; IPr = languages with all indefinite preverbal members of a constituent; IPo = languages with some indefinite postverbal members of a constituent):

a)



b)



The sixth and the seventh statements are concerned with the relationship of object agreement markers and the other sentence constituents from the point of view of formal and semantic distinction and intrasentential cooccurrence. A full universal characterization of the properties

of object agreement markers would involve being able to tell for any language what segmental, suprasegmental, and sequential properties the agreement marker has as compared with other constituents. The proposed statements fall short of doing this in that they underspecify the agreement marker by pointing only at some formal, semantic, and syntactic properties of it; but at the same time they make universal generalization both about the formal and semantic distinctness and about the intrasentential cooccurrence restrictions of object agreement markers, markers of agreement with other nominal constituents, and personal pronominal objects.

The formal distinctness of subject, direct object, indirect object, and adverbial agreement markers, the formal resemblance of all complement agreement markers as opposed to subject agreement markers, and the cooccurrence of subject and complement agreement markers all noted in the sixth statement can be illustrated from AMHARIC (Getatchew 1971, 101):

səbbər-əcc	"broke-she"	'She broke it.'
səbbər-əcc-ɨw	"broke-she-it"	'She broke it.'
səbbər-əcc-ɨll-ət	"broke-she-for-him"	'She broke for him.'
səbbər-əcc-ɨbb-ət	"broke-she-with-it"	'She broke with it.',

(where -ət is an allomorph of -ɨw). The only language in my sample where three agreement markers may intrasententially cooccur is MODERN GREEK; e.g. o Petros mu to dini to krasi emena "the Peter to-me it gives the wine to-me" 'Peter gives me the wine.' (Drachman 1970, 6). In LEBANESE ARABIC, the verb agrees either with the direct or with the indirect object, in addition to the subject, the choice being free if both can be agreed with, whereas in AMHARIC and in WALBIRI agreement with the indirect object takes precedence over agreement with the direct object in such cases (Fulass 1971, Hale 1973, 333ff). In AMHARIC, ARABIC and WALBIRI, where the object marker and subject marker both follow the verb and in MODERN GREEK and SPANISH, where the object marker follows the stem, the object marker is separated from the verb by the subject marker. In SWAHILI and ZULU, both subject marker and object marker precede and the former precedes the latter.

The final observation is about the formal distinctness and intrasentential cooccurrence relationship of object agreement markers and personal pronouns. It says that object agreement markers are not unique form-meaning constituents, but that they resemble personal pronouns both semantically and formally, by partially shared form and shared function. Underlying the observation that the form of personal pronouns

and object agreement markers is significantly similar in all languages examined is actually a set of observations about a whole range of formal similarities, including sequential, intonational, and phonological segment membership properties of such forms, and combinations of these. On the whole, it appears that these forms tend to exhibit similarities with respect to phonological segment membership, and that they tend to differ intonationally and order-wise. In particular, whereas object agreement markers are always stressless, object personal pronouns may be stressed. Similarly, whereas object agreement markers are always adjacent to the verb and consistently to its left or to its right in any one language[8], independent object personal pronouns often have a less strictly fixed position, and their most normal position, one adjacent to the verb, is not necessarily on that side of the verb where the object agreement marker is. Compare MODERN GREEK o Petros me filise emena "the Peter me kissed me" (where me is the object agreement marker and emena the object personal pronoun) and o Petros emena me filise, both meaning 'Peter kissed me.', and the ungrammatical o Petros filise me emena and o Petros emena filise me (Drachman 1970, 5-6).

Let us turn to the examination of phonological segment membership similarities between personal pronouns and object agreement markers. Such similarity in some cases does not go beyond the fact that both object personal pronouns and object agreement markers tend to consist of relatively few segments--i.e. they are short. The number of syllables in corresponding object agreement markers and object personal pronouns is either identical or if non-identical, it is generally the personal pronouns that is the larger one. Characteristic shortness of form, however, is not an exclusive property of object personal pronouns and object agreement markers, but characterizes a much larger class of constituents in most languages, including any affix or "grammatical particle". In most cases, however, the object agreement marker and the object personal pronoun have a more specific similarity as well which results from shared phonological segments. Compare, for instance, the consistently shared consonants in SPANISH object agreement markers me, te, and le, and in the corresponding object personal

---

[8] In some languages, the position of the object agreement marker does change according to some properties of the verb. In MODERN GREEK and in SPANISH, the object agreement immediately precedes the verb, unless the verb is an imperative in which case it follows it in MODERN GREEK (Drachman 1970, 27), or unless the verb is an imperative or an infinitive, in which case it follows it in SPANISH.

pronouns a mi, a tí, and a el.[9] It should be noted that whereas object agreement markers generally tend to resemble object personal pronouns, object personal pronouns are not always the constituents that they resemble most; in some cases they resemble other elements of pronominal nature such as various types of determiners. In ZULU, for instance, object agreement markers do not share any phonological segments with object personal pronouns, but they are almost identical with nominal class prefixes. In MODERN GREEK, the third person object agreement marker is formally identical with the definite article. And in HUNGARIAN the object agreement markers are formally almost identical with the nominal possessive suffixes.

The partially shared function of object agreement markers and personal pronouns can be illustrated by data from ZULU (E. Kunene, personal communication):

yena uyamubona umfana	"he he-tense-him-see boy"	'He sees the boy.'
yena uyamubona yena	"he he-tense-him see him"	'He sees him.'
yena uyamubona	"he he-tense him-see"	'He sees him.'
yena uyangibona mina	"he he-tense-me-see me"	'He sees me.'
yena uyangibona	"he he-tense-me-see"	'He sees me.',

where -mu- ...yena is shown to contribute to the meaning of the sentence in the same way as -mu- by itself; and -ngi- ...mina as -ngi- by itself; or from SPANISH (Tito Oviedo, personal communication):

a María Juan la ve con frecvencia
"object-case-marker Mary John her sees with frequency"
'John sees Mary often.'

a ella Juan la ve con frecvencia
"object-case-marker her John her sees with frequency"
'John sees her often.'

Juan la ve con frecvencia
"John her sees with frequency"
'John sees her often.'

a mí Juan me ve con frecvencia
"object-case-marker me John me sees with frequency"
'John sees me often.'

---

[9] On the historical development leading to such phonological similarities between object agreement markers and object personal pronouns, compare Givon 1971, 403, where the hypothesis is advanced that all verb agreement markers, object or not, always arise from independent pronominal forms.

Juan me ve con frecvencia
"John me sees with frequency"
'John sees me often.',

where a ella...(la) and la; and a mí... (me) and me are shown to contribute equally to the meaning of the sentence.

It should be noted that although the sentence pairs whose members differ by one of them containing an independent pronoun in addition to the object agreement marker are said to by synonymous, it is often pointed out in grammars that the sentence containing the additional constituent conveys a more emphatic reference to the referent of the pronoun.

The synonymy observation with respect to sentences involving a personal pronoun object or just an object agreement marker can be made even more significant in the following sense. In the languages that I have examined all tokens of object personal pronominal reference can also be expressed by some object marker. What this means is that the person, number, and gender classes of referents distinguished by object personal pronouns can also always be distinguished by object agreement markers as well. In BANTU languages, for instance, there is a separate object agreement marker corresponding to each unbound object pronoun.

Our observations can be appropriately summarized as observations about agreement-significant similarities of things that in other ways appear to be significantly different from each other and about agreement-significant differences between things that in other ways are known to be significantly similar. In particular, we noted that within any particular language nominal constituents, even though all of them are nominals, consistently differ in whether the verb agrees with them or not depending on their membership in major constituent classes, on their definiteness, and on their position relative to the verb; that languages, even though all of them are languages, differ in which of these nominal classes the verb agrees with; that languages, even though they are different languages, resemble each other by observing the same set of precedence restrictions among the agreement-significant nominal constituents in selecting their agreeing nominals; that the use of the object agreement marker overlaps with that of object pronouns, even though their form is not exactly the same; that the form of object agreement markers is generally significantly similar to the form of some personal pronominal object, even though their uses are not exactly the same; and that the object agreement marker tends to be similar in form to other complement agreement markers even though those mark agreement with other complements and is relatively different from subject agreement markers even though both mark agreement with major sentence constituents.

It is by no means obvious from a set of observational statements of this kind what exactly they say, why they have been made, and how they are to be accounted for. First of all, are these statements really observations about languages--that is to say, can one really claim to have "observed" a verb agreeing with its object? If one cannot, and if the category and relation terms that have been used here in their traditional senses all turn out to be abstract, or void of direct empirical content, then how could these statements still be tied to reality so as to render the claims included in them verifiable in terms of immediate observations about given sentences of given languages? Second, why single out these statements of the vast set of possible recording statements that could be made about sentences that have agreement in them and implicitly claim that these are the "right" ones or that these are a "significant" set of such statements? Third, having recorded all of these (directly or indirectly observed) linguistic facts, what should be the "next step"--that is to say, what might constitute an explanation of these observations?

There are of course intuitive answers to all three of these questions which intuitions would probably be shared by most if not all linguists. In particular, a linguist would be able to tell in most cases whether object-verb agreement is manifested or not in a given set of sentences. He would also know, intuitively, that observations about similarities and differences among languages with respect to the expressions of the same meanings are significant observations for linguistics; and he would have feelings about some intuitively satisfying ways of explaining such facts. The explication of intuitions, however, will be recognized in this paper as a basic requirement for scientific discussions.[10]

Our attempts for the rest of this paper will be aimed at answering the questions raised above by trying to establish the empirical verifiability, the theoretical significance, and the explainability of our observations about object-verb agreement and by proposing an actual explanation for some of them. However, first I would like to discuss some assumptions and hypotheses about linguistic observations, linguistically significant observations, and linguistic explanations in general, so as for these general assumptions and hypotheses to serve as guides for our continued consideration of the specific facts of object-verb agreement.

---

[10] For a very revealing discussion of this question, compare Sanders 1972c, 22. My indebtedness to Sanders' writings throughout this entire paper is very great and it extends far beyond the points where I will be able to make actual references to them. Restatements, interpretations, and applications of Sanders' ideas naturally reflect my present familiarity with them and present understanding of them.

1.2. Assumptions and hypotheses about grammars

In the ensuing discussion distinction will be made between assumptions and hypotheses. Whether a statement is an assumption or a hypothesis can be determined relative to a particular theory. In particular, an assumption will be taken to be a statement whose truth or falsity is not subject to confirmation or disconfirmation within that theory; and a hypothesis will be taken to be a statement whose truth or falsity is directly contingent on the nature of what are considered to be facts by the theory.

Answers to the questions: What is a linguistic observation? What is a linguistically significant observation? and What is an explanation of of any linguistic observation? are assumed by linguistic theory. Answers to these questions serve to determine the range of facts the theory can and should be concerned with, as well as the goal of the theory--in other words, they determine what part of the observable reality the linguist can and should consider and what he should do with it. Particular explanations to particular observations, on the other hand, all conforming to the assumed general nature of explanations, are hypotheses; and all hypotheses of linguistic theory, in fact, are hypotheses participating in explanations of linguistic observations.

In relation to the first question about what are directly observable facts of language it will be assumed, following Sanders (e.g. Sanders 1970b and 1972a), that all such facts are properties of sounds, properties of meanings, and relations of sounds and meanings. In particular, it will be assumed that the sound properties include phonetic properties, such as VOICED and NASAL, and temporal precedence relations among sets of them; and only those; that the meaning properties include semantic properties, such as HUMAN or PAST, and cognitive grouping relations among sets of them; and only those; and that the basic relation between sound and meaning is symbolic equivalence and non-equivalence. The manner in which these assumptions are formally presented in a linguistic theory is that all interpreted constants specified in its governing metatheory are interpreted into phonetic or semantic properties, or into temporal precedence, or into cognitive association, or into symbolic equivalence, or into symbolic non-equivalence; and that a homomodality constraint on interpretable representations is also metatheoretically specified. This characterization of what are linguistic observations, or interpretable linguistic representations, defines statements such as "in this sound sequence a nasal follows the vowel" or "in this meaning TALL and ANIMATE refer to the same individual" or "the sound form dog does not mean a feline being in ENGLISH" as observations and defines statements such as "TALL is followed by t" or "this verb governs

the accusative case" as non-observations, since the former of these latter two is not a homomodal statement and the latter mentions uninterpretable terms and relations.

Turning now to the characterization of linguistically significant observations, it will be assumed that of the infinite number of phenomenon sets in the world that are all potential objects of inquiry, the object whose characterization linguistic theory is concerned with is the set of all sentences in all human languages; and that of the infinitely wide range of properties of this complex object that are observable in the above sense, the ones that are significant for linguistic theory are all statements about the symbolic equivalence between sentential meanings and sentential forms such that whereas in these observation statements reference may be made both to specific, or constant, and variable semantic properties of the sentences involved, no reference is made to specific, but only to variable, phonetic properties.[11] This assumption about linguistically significant attributes characterizes observational statements about sound-meaning relationship, about analytic and self-contradictory sentences, about monolingual and crosslinguistic synonymies and ambiguities and about sentences that are in semantic entailment, or presupposition, or contradiction relationship with each other as statements about linguistically significant attributes of sentences of human languages; it characterizes observational statements such as "the expression of meaning A starts with a k in ENGLISH" as not stating a linguistically significant attribute since it makes reference to a phonetic constant; and it characterizes non-observational statements such as "the derivation of a sentence that can be observationally characterized by the sound-meaning relation A = a includes a line with two adjacent nominals" also as not

---

[11] For a general discussion of object-significance and attribute-significance in linguistics, see Sanders 1972c, and also Sanders 1972a, 60-63. The above assumptions are all restatements of what Sanders says, except for the fact that he assumes that the linguistically significant object is the set of all discourses, rather than sentences, of all human languages. He argued this point both in Sanders 1972c and also in Sanders 1970a and in the face of his arguments the present assumption about sentence domain appears to be inferior, justifiable, perhaps, only as a working assumption for crosslinguistic studies such as the present one (since most language descriptions do not provide discourse information), but not as a theoretical assumption.

asserting a linguistically significant attribute since it is not even an observation statement. The formal equivalent of these assumptions, which simply say that language is a symbolic object where meanings are communicated and understood by means of sounds, is that linguistic metatheory includes a specification of theorem types that have immediate interpretations and whose immediate interpretations are the linguistic attributes listed above.[12]

Thirdly, let us consider what might be a fruitful assumption to make about how to explain linguistically significant observations. An explanation of any observation is, of course, a statement that strikes the majority of normal, competent, and interested individuals as being explanatory. It seems, however, that statements that turn out to be explanatory in this intuitive sense also have some substantive and even some formal characteristics in common which are not shared by statements that are not intuitively explanatory; and thus these properties can be taken to be diagnostic to some extent of explanatoriness in the absence of converging judgments. In particular, a common substantive element of all explanations appears to be that of showing that a puzzling phenomenon, i.e. the explanandum, is the "same" as some familiar phenomenon. The set of principles which facilitate this reduction of something that is not understood to something else that is can thus be called explanatory principles. The fact, for instance, that paper burns can be explained by reducing this observational statement to the observation that wood burns, by reference to the fact that paper is made of wood and to the explanatory principle that in the course of some processes, which include that of paper manufacturing, some properties of some materials, including the basic combustability properties of wood, remain invariant. It also seems that an explanation of this kind is more convincing, the more patent the truth of the statement is to which the explanandum is thus reduced. For this reason, the best possible explanation that can be provided for an empirical observation is one which effects the reduction of that observation to a logically true statement, since the truth of logically true statements is more obvious than the truth of any empirically true statement can be. Given now an observation statement whose form is equational, such as all observations that we have accepted above as significant for linguistics, the best explanation that the above considerations determine for such a statement would be one which effects its reduction to a logically true, i.e. to an idempotent, equation.

---

[12] For the formal properties of the corresponding theorem types, compare Sanders 1972c, 29.

Sanders proposes (1972a, 17-23) that what it means to use the rules of a grammar is just this: to show the derivability (i.e. the equal truth) of a linguistic theorem (i.e. a bimodal equational statement) in respect to an idempotent equation. He further proposes that a linguistic theorem A = B should be considered to be proven under one of two conditions: if it can be shown to be in a derivability relationship in respect to the idempotent equation A = A, or if it can be shown to be in such relation to the idempotent equation B = B.[13] Given our considerations above, a proof of this kind can justifiably be regarded as the explanation of the theorem that it is a proof of, since what it does is showing that an empirical observation to be accounted for--i.e. the interpretation of the sentencehood theorem A = B--is a covert, or disguised, version of a logically true statement, A = A or B = B. The principles therefore in terms of which this "revelation" can be effected, which are the principles of the substantive and inferential rules of the grammar, can thus be justifiably regarded as explanatory principles in respect to all observations which are interpretations of theorems for the proof of which these principles can be used, and we will therefore regard them as such henceforth.

It is important to note that the explanatory nature of these principles is of course relative, as the explanatory nature of all other principles is. In particular, whereas grammatical rules constitute the explanans in respect to observations about languages, they are explananda of theories which aim at explaining properties of grammars of languages, rather than properties of languages themselves. Such explanations of explana-

(that the idempotent equation should be terminal)

---

[13] This is a logically non-necessary stipulation. In particular, one could say that a linguistic theorem equation is proven if it can be shown in derivability relation with respect to any idempotent equation. This would then let the proof of such a theorem, A = B, be the showing of its derivability relation with respect to a C = C where C is or is not distinct from both A and B. This looser definition of the condition of proof would characterize as proofs not only homodirectional derivations (i.e. derivations all of whose steps are either phonetically directed or semantically directed), but also heterodirectional derivations where some of the steps are phonetically directed and some are semantically directed. In other words, it would be possible to apply, for instance, the syntactic axioms of the grammar to the semantic member of the theorem equation, the phonological axioms to the phonetic member, and continue both derivations until they "meet"--i.e. until there is a representation found that is a member of both derivational representation sequences.

tions can furthermore be regarded as explanatory not only of the statements that they directly explain, but also of the statements that are explained by the statements that they directly explain. The explanations of grammatical rules are thus also higher-level explanations of linguistic facts.

The three assumptions specified above about linguistic observations, linguistically significant observations, and linguistic explanations provide a basis for discussing the relationship of our data on object-verb agreement to observable facts, for discussing their significance, and for discussing their explainability. Before going on to that discussion, however, I would now like to consider certain general hypotheses concerning the content and form of the explanatory principles of grammars--that is to say, concerning the specific formal and substantive characteristics of linguistic rules. This discussion will then serve as a basis for searching for an actual explanation of our observations about agreement.

In terms of our considerations above, the process involved in explaining a linguistic observation is reducing the corresponding equational statement to either of two idempotent equations; i.e. demonstrating the equality of truth values with respect to the theorem A = B and either A = A or B = B. There are fundamentally two kinds of principles that are necessary for this process: principles that can be used to effect the reduction of A to B (or that of B to A) and principles that determine how the former are to be used in order for them to actually effect such a reduction. The former are the substantive rules, or substantive axioms, of the grammar and the latter are the rule-applicational-rules, or inferential axioms. I will first consider predominantly hypotheses concerning the membership of the set of necessary and sufficient principles of the first type and will subsequently consider the general question of inferential principles.

Considering the possible range of grammatical rules and rule-applicational principles that may possibly belong to the set of principles that turn out to be necessary and sufficient for demonstrating the truth of all true and significant observations about languages, it appears that there is one member of each of these two principle sets whose existence is not hypothetical--i.e. that is not subject to confirmation or disconfirmation by linguistic facts--but whose existence follows from the assumptions that we have made above. In particular, from the understanding that all linguistic theorems for the proof of which such principles are to provide are observation statements about sound-meaning equivalences, and that the proof of such a theorem consists of demonstrating the derivability relationship of the bimodal theorem from one of two monomodal

idempotency equations--such as the derivability of the bimodal theorem dog = DOG[14] from one or the other of the monomodal equations DOG = DOG or dog = dog--it follows, that the grammar will have to include some principles that predicate symbolic equivalence between meaning representations and sound representations. In other words, grammars have to include some sound-meaning substitution statements, or lexical rules. Second, there has to be a rule-applicational principle which governs the obligatory and appropriately directed use of such bimodal substitution statements, so that they effect only the substitution of semantic elements by phonetic elements in phonetically directed proofs, and only the substitution of phonetic elements by semantic ones in semantically directed proofs.

Since grammars thus by definition include some bimodal substitution statements, the most restrictive hypothesis about the set of necessary and sufficient rule types included in natural language grammars would be to say that all rules of such grammars are bimodal substitution statements. Grammars of this kind written for natural language sentences would consist of a set of rules each of which is necessary and sufficient for the proof of one and only one sound-meaning equivalence theorem of one sentence in one language. A universal sentence-dictionary of this kind, enumerating all possible thoughts paired off with all of their possible expressions in all languages, would indeed characterize, by means of simple enumeration, all sentences of all languages in terms of the basic linguistically significant attribute of sound-meaning equivalence. However, in spite of the empirical sufficiency (for all practical purposes) and the partial principledness of universal sentence grammars of this sort, linguists would never be content with writing such grammars--not even when the completeness of their grammar is not one of their primary goals and thus the consideration that a factually complete universal grammar of this sort could never be written may carry little weight. This is because although it is possible to imagine symbolic systems for which a grammar consisting of the set of necessary and sufficient rules would indeed consist of the listing of all true sound-meaning equivalence theorems in the system, natural languages are not of this type. Natural language grammars of this kind would leave many cross-sentential and crosslinguistic generalizations unsaid and would thus turn out to be grossly redundant.

---

[14] Words spelled in upper case letters are parts of semantic representations; underlined lower-case words stand for phonetic strings.

Since a natural language grammar including only bimodal substitution statements is thus seen to fall short of the requirement that a grammar should contain a necessary and sufficient set of rules, but, on the other hand, by assumption, it has to contain some bimodal substitution statements, the next most restrictive hypothesis that one might make about the set of necessary and sufficient rules included in natural grammars is that such grammars include some bimodal substitution statements and, in addition, some other rules all of which are just like bimodal substitution rules in all respects except for the fact that they cannot be used by themselves to effect bimodal substitutions. According to this hypothesis rules of the grammar could be characterized as follows:

a. All grammatical rules are equational statements.

b. All grammatical rules make reference only to elements that are either immediately interpretabel semantic properties and relations or immediately interpretable phonetic properties and relations.

c. No grammatical rule makes essential reference to a representation that includes both semantic and phonetic property or relation labels.

These hypotheses are clearly empirical ones subject to confirmation or disconfirmation by facts of language. In particular, the first hypothesis about the equational nature of all grammatical rules would be falsified either if it turned out that not all grammatical rules express a symmetrical relationship--i.e. if the directed use of some rules would have to be specified rule-specifically; or if it turned out that some grammatical rules predicate some relationship between linguistic representations that is different from symbolic relationship--such as "R_1 is understood to be true only if R_2 is understood to be true", or "R_1 is more frequent in use than R_2". The second hypothesis about all terms included in rule statements being interpretable semantic and phonetic terms would be disconfirmed if terms of some third type which have no immediate interpretation into any observation about language would turn out to be necessarily referred to by some rules. Finally, the third hypothesis would turn out to be false if rules that refer to a mixed, or bimodal, representation would turn out to be necessarily included in grammars.

Let us now consider the possible range of variation for rules that remains to be allowed for within these restrictive hypotheses. It appears that there are only two possible ways in which rules are now permitted to differ from each other. One of these is the manner of distinctness between the two representations that the rule predicates symbolic equivalence of and the other is the type of interpretable elements referred to in the representations--in particular, whether they

are semantic or phonetic property labels or semantic or phonetic relation labels; and whether they are constants and variables. Whereas I cannot consider in detail all logical possibilities, I will indicate the major categories along each of these dimensions and then attempt to summarize some results of linguistic research with respect to which of these possibilities may belong to the necessary and sufficient set of grammatical rule types.

Let us first consider the basic ways in which two sides of grammatical rules can differ from each other. Any two linguistic representations, or any two arbitrary objects, for that matter, that consist of sets of properties, may either share all of their elements, or they may share some but not all of their elements, or they may share none of theme. If the two representations are connected by an equation sign, these three possibilities can be schematized as follows (where A and B stand for non-null linguistic representations):

a.	all elements shared:	1.	A = A
		2.	A = AA
		3.	AB = AAB
b.	some but not all elements shared:	1.	A = AB
		2.	AB = AC
c.	no elements shared:		A = B

Of these, a.1. cannot be a possible schema for a linguistic rule, since it does not express an empirical hypothesis; in particular, its truth does not hinge on the existence or non-existence of any linguistic, or any other actual, state of affairs and thus it cannot say anything about language that is specific to it. The schema under a.2. is a context-free, or unconditioned, variable-addition-deletion rule and it seems difficult to imagine how a statement of this kind might express a law-like statement.[15] Thus we are left with a.3., b.1., b.2., and c.[16] These four

---

[15] The same consideration holds for context-free addition-deletions of constants, such as $\emptyset$ = B. This schema cannot constitute a possible rule type since what it expresses is an unconditioned addition-deletion which is not the expression of any regularity.

[16] The schema a.3., too, expresses logical truth with respect to relations of sets, but since it is not assumed that linguistic representations are sets, it remains an empirical claim to say that rules of this type constitute a rule type in grammars. For discussion of this, see Sanders 1972a, 111, footnote 9.

equation types can appropriately be called, respectively,

1. context-sensitive variable-addition-deletion
2. context-sensitive constant-addition-deletion
3. context-sensitive substitution
4. context-free substitution.

Since all possible types of distinctness relations between two representations can be mediated by such rules, all grammatical rules will belong to one of these four types.

Not all four of these relations between representations are equally primitive. In particular, all one-step substitution processes, whether context-free or context-sensitive, can be represented by the intrinsically ordered sequence of two appropriately directed constant-addition-deletion rules. The reason why this is so is that equivalence relations are transitive. For instance, if

dog = Y and
DOG = Y, then
dog = DOG;

and if Y = DOG dog, then dog = DOG dog and DOG = DOG dog. These two rules now can be used to effect the one-step substitution process dog = DOG in the following manner:

	given: DOG
addition rule: DOG → DOG, dog	output: DOG, dog
deletion rule: DOG, dog → dog	output: dog.

A context-free substitution process can thus be effected by the application of a target element addition rule and the intrinsically ordered subsequent application of an initial element deletion rule. Similarly, context-sensitive substitutions, such as X DOG = X dog, can be equivalently expressed by the appropriate application of the two rules X DOG = X DOG dog
X dog = X DOG; or, simpler,
by these two rules: X = X DOG
X = X dog. The directed substitution process X DOG → X dog can now be expressed by a target element addition rule and an initial element deletion rule applied in either order (but intrinsically restricted from applying simultaneously); that is to say, either like this:

	given: X DOG
addition rule: X → X dog	output: X DOG dog
deletion rule: X DOG → X	output: X dog,
or like this:	given: X DOG
deletion rule: X DOG → X	output: X
addition rule: X → X dog	output: X dog.

For grammars that include only substitution rules, such as the minimal one we considered before, to assume that the necessary substitution

processes are effected by one-step substitution processes or to assume that they are effected by two-step addition-deletion rules are two equivalent hypotheses, notational variants of each other. This is because in optimally simple, i.e. non-repetitive, proofs, the addition-deletion rules will be used only so as to effect immediate substitution anyway; and since the rule-applicational principles necessary to restrict the use of rules to obligatory and terminally directed application, in order to eliminate repetitive proofs, will have to be the same under either assumption. In grammars, however, that hypothesize the existence of addition-deletion rules independently from substitution processes, there seems to be some point in raising the question as to whether it is necessary to assume the existence of both addition-deletion rules and also that of substitution rules. Since addition-deletion processes cannot be effected by any application of substitution rules only, but all substitution processes can be equivalently expressed by addition-deletion, it would seem that substitution rules will not have to be assumed as a separate rule type of grammars and that all grammatical rules will be either context-sensitive addition-deletions of constants or context-sensitive addition-deletions of identical elements.

The reason why this is not the right conclusion to arrive at is that the assumption of two specific addition-deletion rules, on the one hand, and the assumption of a one-step substitution rule that corresponds to them in the above sense, on the other hand, are not in fact equivalent assumptions in that the assumption of the two addition-deletion rules allows for a wider range of applicational alternatives, in terms of directed use, applicational precedence, and applicational adjacency, than the assumption of a single substitution process. In particular, the single substitution rule would have two uses depending on the direction in which it is used. The two addition-deletion rules, however, each have in principle two directed uses so that with respect to the two rules there are four direction alternatives (a. adds, b. deletes; a. deletes, b. adds; a. adds, b. adds; a. deletes b. deletes); for each of these four cases there are in principle two respective applicational precedence options (a. precedes b., b. precedes a.) and for each of these there are two further alternatives of the two rules applying in an immediate sequence or in a non-immediate sequence.[17] Thus, whereas the proper applications of the two addition-deletion rules in order to effect substitution is of course included in this list as two of the sixteen options, there is a large number of additional applicational

---

[17] The possibility of simultaneous application, reapplication, and obligatoriness-optionality alternatives would introduce further applicational options.

options that the assumption of the two addition-deletion rules permit but the assumption of the simple substitution rule does not. The question that is therefore relevant to the choice between a one-step or a two-step substitution process is whether the additional applicational options permitted by the two-step process are empirically justified or, if not, whether they can be excluded by some general principles of rule application.

As it turns out, most of the options are in fact excluded on rule-intrinsic grounds--that is to say, the two rules just cannot apply according to many of these options since the structural description of the second of them would not be satisfied. The alternatives not excluded on intrinsic grounds are the following:

1. all 8 non-adjacent applications
2. the 2 precedence alternatives of both rules adding (and for the rules effecting context-sensitive substitution, also the 2 precedence options of both rules deleting)
3. one (for the context-sensitive rules: both) of the precedence alternatives of one rule adding and the other deleting.

Of these, the alternatives under 3. are the ones that effect substitution and thus the decision between the two-step or the one-step substitution process has to be made by considering 1. and 2. Relevant considerations are whether the output of the rules applying according to 1. and 2. are justifiable as either terminal or intermediate representations and, if not, whether such applications can be excluded by general rule-applicational principles. In particular, decisions can be made as follows:

Given a set of data, 1. decision in favor of the two addition-deletion rules, to the exclusion of the corresponding substitution rule, will be made, if

a. both representation schemata referred to by each of the two rules are justified either as part of a final output of the grammar or as a representation that other rules have to apply to: or if

b. representations resulting from the joint additive effect of the two rules and (if intrinsically not excluded) from the joint deletive effect of the two rules can be justified either as part of the final output of the grammar or as a representation that other rules have to apply to; or if

c. either a. or b. or both are not the case but there are general rule-applicational principles to exclude the unjustifiable applicational options; and

2. decision in favor of the substitution rule, to the exclusion of the two corresponding addition-deletion rules, will be made if a. or b. in 1 is not the case and neither is c.

The total grammar will include only addition-deletion rules if with respect to no set of data are there grounds for deciding in favor of substitution rules; it will contain only substitution rules if with respect to no set of data are there grounds to decide in favor of addition-deletion rules; and it will include both kinds if different sets of data lead to different decisions.

Having now considered the range of possible rule types from the point of view of the degree and manner of distinctness of the two representations that they predicate symbolic equivalence of, and having concluded that no rule can be other, in this respect, than either a context-sensitive variable addition-deletion rule, or a context-sensitive constant-addition-deletion rule, or a context-free or context-sensitive substitution rule, the choice as to which of these four types should be included in grammars being an empirical one, let us now turn to considering qualitative properties of the representations involved; in particular, whether the terms included in them are semantic labels or phonetic labels, and whether they are property labels or relation labels.

According to interpretable element types, rules can be one of the following three types (where S stands for a representation that consists only of semantic property or relation labels, and P stands for a representation which includes only phonetic property and relation labels):

$$S = S$$
$$P = P$$
$$S = P.$$

The remaining logically possible options SP = SP, SP = S, and SP = P will be excluded if the hypothesis that no rule refers to a bimodal representation is correct.

According to whether representations include property labels or relation labels or both, the options, restricted by the consideration that no representation can only consist of a relational element, since a relation is always a relation of constituents, are these: either neither representation, or one representation, or both representations, include relational elements. The following list shows the options for S = S, P = P, and S = P type rules (where X_p stands for a representation that consists only of property elements, and X_pX_r stands for a representation that includes both property and relation labels):

1. <u>for S = S</u>

1.1 $S_p = S_p$

1.2 $S_p = S_p S_r$

1.3 $S_p S_r = S_p S_r$

2. <u>for P = P</u>

2.1 $P_p = P_p$

2.2 $P_p = P_p P_r$

2.3 $P_p = P_p P_r$

3. for $S = P$

3.1 $S_p = P_p$

3.2 $S_p = P_p P_r$

3.3 $S_p S_r = P_p$

3.4 $S_p S_r = P_p P_r$

Since, of these, all S = P schemata (3.1, 3.2, 3.3, 3.4) can only be context-free substitutions, since the schemata, based on the hypothesis that no rule ever refers to a bimodal representation, do not allow for context; and since 1.2 and 2.2 can only be constant-addition-deletion rules and substitution rules but not variable-addition-deletions; but all other types listed can represent any of the four rule types distinguished according to the manner of difference between the two sides, the total number of rule types determined by the three parameters considered--manner of difference between the two sides, modality of elements included, type of elements included--and restricted by the hypothetical assumptions that rules are all equational, they refer only to interpretable elements, and they never refer to bimodal representations, is 26.

	context-sensitive constant-addition-deletion	context-sensitive variable-addition-deletion	context-sensitive substitution	context-free substitution
$S_p = S_p$	X	X	X	X
$S_p = S_p S_r$	X		X	X
$S_p S_r = S_p S_r$	X	X	X	X
$P_p = P_p$	X	X	X	X
$P_p = P_p P_r$	X		X	X
$P_p P_r = P_p P_r$	X	X	X	X
$S_p = P_p$				X
$S_p = P_p P_r$				X
$S_p S_r = P_p$				X
$S_p S_r = P_p P_r$				X

Y stands for possible

Having thus characterized a set of alternatives for the range of variation for equational rules that grammars may include, we will now consider some empirical evidence to indicate which of the 26 defined types do in fact characterize actual grammatical rules; and, also, if there are any other types of rules that turn out to be necessary, which would then constitute evidence against some of the three initial hypotheses that we have made about grammatical rules.

Considering S = P rules first, the types that in fact turn out to be necessary are these:[18]

A. context-sensitive relation substitution, or ordering, rules:
   a. relation-substitution sensitive to semantic context:
      $S_p S_r (S_r) = S_p S_r (P_r)$; e.g. (DEFINITE), (NOUN, X) = (DEFINITE) & (NOUN, X)
   b. relation substitution sensitive to semantic and phonetic context:
      $P_p S_r (S_r) = P_p S_r (P_r)$; e.g. (VOWEL, X), (CONSONANT, Y) = (VOWEL, X) & (CONSONANT, Y)

B. property and relation substitution, or lexical, rules:
   a. context-free property and relation substitution:
      1. (partial) $(S_p S_r) = (P_p S_r)$; e.g. (NOUN, PLANT, ARBOREAL) = (t), (r), (i:)
      2. (complete) $(S_p S_r) = (P_p P_r)$; e.g. (NOUN, PLANT, ARBOREAL) = (t) & (r) & (i:)
   b. context-sensitive property and relation substitution sensitive to semantic and phonetic context:
      $S_p S_r P_r (S_p) = S_p S_r P_r (P_p P_r)$; e.g. (ANIMAL, BOVINE, X) & (PLURAL) = (ANIMAL, BOVINE, X) & (e & n)
   c. context-sensitive property and relation substitution sensitive to phonetic context:
      $P_p P_r (S_p) = P_p P_r (P_p P_r)$; e.g. (o) & (x) & (PLURAL) = (o) & (x) & (e) & (n)

Of these six rule types, there is only one, the complete version of context-free lexicalization $S_p S_r = P_p P_r$ that fits one of the four bimodal rule types listed above (i.e. B.a.2. matches 3.4). This is because all the other five schemata are at divergence with one of the

---

[18] Following Sanders' notation (e.g. 1972a, 95), (X, Y) means that X and Y are in a semantic grouping relation; and (X & Y) means that X is in a linear precedence relationship to Y. Elements subject to substitution have been circled.

initial hypotheses that we have made about rules--namely, that they do not refer to bimodal representations. Four of the five schemata (A.a, A.b, B.b, B.c) deviate from this hypothesized pattern in that they are context-sensitive rules; context-sensitive bimodal rules, however, by definition, cannot observe the hypothesized constraint since the fact that they are bimodal means that one side includes phonetic elements and the other semantic elements, and the fact that they are context-sensitive means that there is some element included in both representations that remains invariant--i.e. which is either semantic on both sides, or phonetic on both sides. It follows, therefore, that one of the two representations has to include both semantic and phonetic elements--that is to say, it has to be bimodal. Context-sensitive bimodal rules, however, do appear to be necessary in that all relation-substitution rules are context-sensitive and some lexical rules may also be.[19]

In addition to the logical impossibility for a context-sensitive bimodal substitution rule to observe the representational homomodality constraint, the given lexical rules deviate from this principle also because in some of them the term participating in the substitution process is heteromodal itself (B.a.1.) and because in some of them the context referred to is heteromodal: A.b. refers to a context which includes phonetic properties in grouping relation with each other, and B.b. refers to a context consisting of semantic elements and ordering relation.

Whereas these considerations about bimodal substitution rules indicate that the set of such rules that now seem to be necessary goes far beyond the quadruplet listed under 3. above, it should also be noted that at the same time when that set thus turns out to be too weak, it is also too powerful in that three of the four types do not seem to be possible lexical rules of natural language grammars. These are the types 3.1., 3.2., and 3.3., all of which, as opposed to the actually occurring 3.4., are characterized by the fact that at least one side of the equation is constituted by a set of unrelated (i.e. neither ordered nor grouped) property elements, i.e. by S_p or by P_p.

Bimodal substitutions, as all other substitutions as seen above, can be effected by a two-step addition-deletion process. General criteria for the evaluation of choices betwen one-step substitution and equivalent addition-deletion rules have been provided above and we will now consider

---

[19] For a discussion of the alternatives of the above cited oxen-lexicalization rule and of the general question of the context-sensitivity of lexical rules, compare Sanders 1972a, 91-92, footnote.

the choice in terms of those criteria in the case of bimodal substitution. What is at issue is whether grammars should include lexical rules like DOG = dog and (DETERMINER, X) , (NOUN, Y) = (DETERMINER, X) & (NOUN, Y) or whether they should contain rules like: DOG = DOG, dog and: dog = DOG, dog; and rules like: (DETERMINER, X) , (NOUN, Y) = (DETERMINER, X) , & (NOUN, Y) and (DETERMINER, X) & (NOUN, Y) = (DETERMINER, X) , & (NOUN, Y). As noted above, decision in favor of the two addition-deletion rules will be made either if both representation schemata that each of the two rules refer to are justified by being included either in a well-formed terminal representation or in a representation that other rules of the grammar refer to; or if this is not the case but there are general principles that can restrict the application of the two rules so that they can only be used to effect immediate substitution. Considering the particular alternatives specified above, it would seem that the adoption of appropriate addition-deletion rules, rather than direct substitution axioms, would be justified since although the use of these addition-deletion rules for purposes other than effecting substitution would not be motivated, all such non-substitutive uses can be excluded by independently motivated principles of rule application. In particular, three simple principles of Sanders' whose general rationale and independent motivation will be discussed below in the final part of this section--the principle that all rules that are able to make a contribution to increasing the number of distinct elements of a representation which elements are of the target mode in that given proof (i.e. the number of phonetic elements in phonetically directed proofs and the number of semantic elements in semantically directed proofs) must apply when they can apply and must apply so as to actually make this contribution; the principle that the directionality of any given rule has to be different in differently-directed proofs; and the principle that no valid proof must terminate in a heteromodal equation (since it must terminate in an idempotent equation)--would prevent the two addition-deletion rules from applying in any way other than in immediate terminally motivated substitution-effecting sequence. Representations, therefore, that refer to the symbolically equivalent semantic and phonetic properties of the same lexical item (e.g. DOG, dog), or representations that refer to both the grouping and the ordering relations of two constituents (e.g. (DETERMINER, X) , & (NOUN, Y)) would always have appropriate deletion rules applying to them eliminating the bimodality of the representation.

These conclusions would seem to be counter to Sanders' decision who hypothesizes that lexical and ordering rules are direct substitutions and that in respect to lexical rules proper, at least, "no arguments against the fundamental correctness of this view are known or presently conceivable" (1972a, 90). Upon further consideration, however, it seems that the hy-

pothesis of direct lexical substitutions is indeed to be favored since it makes a more restrictive claim about the nature of language. In particular, it seems that whereas known languages could be equally well described by grammars including direct lexical substitution rules or by grammars including addition-deletion rules that can be used equivalently, there are logically possible but perhaps non-existing languages that can be equally well described by the latter-type but not by the former-type grammars. In particular, it seems that it would be possible for a grammar of some language to include a rule whose application is conditioned both by semantic properties and relations and also by symbolically equivalent phonetic properties and relations; such as, for instance, a rule that would delete or add an element just in case it is one of the elements in the language that have the form a and just in case it is at the same time one of the elements of the language that have the meaning A. If it is indeed true that there are no such rules in any natural language, then, given the fact that application of such rules is accomodated by grammars including the addition-deletion rules but is not by grammars assuming bimodal substitution axioms and at the same time excluding addition-deletion rules that refer to bimodal representations, the latter type of grammar is to be chosen. In the course of this paper I will proceed in terms of this hypothesis.

Let us now turn to monomodal rules. Although, as we have seen, the existence of bimodal rules is not an empirical hypothesis about language but an assumption, neither the claim that grammars should include rules of the P = P type, nor the claim that they should include rules of the S = S type follows from any assumption that we have made about language. As far as phonological rules are concerned, these have been hypothesized perhaps by all linguists as being part of the grammar--in other words, no linguist would claim that no phonetic properties and relations are predictable from other phonetic properties and relations. The inclusion of S = S type rules in grammars, however, is not nearly as widely recognized. The standard version of transformational generative syntactic theory, for instance, does not hypothesize the existence of such rules.[20] The existence of S = S type rules, however, and the non-

---

[20] According to this grammatical model, all lexical, including order-related, substitution processes are effected by two derivationally non-adjacent steps: a presyntactic addition of "spelling" and of constituent ordering, and a post-syntactic deletion of syntactic category and feature labels of hierarchical relations (although it is not clear to me whether linear order is added to semantic relations at any point, rather than being

necessity of syntactic rules applying to ordered representations has been argued by Sanders (1969, 1970b, 1972a) and the hypothesis concerning their existence will be accepted here.

Sanders proposes that phonological and syntactic rules are basically of the same two types: either constant-addition-deletions, or variable-addition-deletions (but not substitutions, context-sensitive or context-free).[21] There are at least two respects in which syntactic and phonological rules seem to differ. One is that syntactic rules do not only refer

---

(Footnote 20 continued)
present in terminal semantic representations as well; and it is not clear whether hierarchical relations and syntactic category labels are ever deleted in a motivated way in the process of the derivation--in other words, whether the assumption that semantic representations are free of ordering and phonetic representations are free of non-phonetic elements and relations is adopted or not). As a result, syntactic transformations operate on representations that include categories and features that are both semantic-syntactic and phonetic and whose relationships are both hierarchical and linear. Thus the power for syntactic transformations to be able to refer to both semantic and phonetic elements is made available both with respect to categories or features and relations. Since the notation provided by the theory is such that it is possible to refer to semantic-syntactic categories without referring to phonological representations of lexical items, and since natural language data apparently do not require syntactic rules to refer to both phonetic and semantic-syntactic categories, reference by transformations to both semantic-syntactic and phonetic categories can be and is generally avoided in transformational generative grammars. Since, however, although it is notationally possible to refer to dominance-independent linear precedence relations of constituents, it is notationally not possible to refer to order-independent hierarchical relations, hierarchically defined constituent classes are always referred to by also referring to their linear relations which may be irrelevant or actually disruptive of the class in question. For a discussion of this in relation to lexicalization, see Sanders 1967, 106ff; 1972, 90ff and 143ff; in relation to ordering, see Sanders 1970b, 1969.

[21] For a detailed discussion of the rule types he proposes, compare Sanders 1972a, 64ff; and for a summary see 122-25. In addition to these two monomodal rule types and to bimodal substitution rules, he also proposes a fourth rule type, non-equivalence axioms. I cannot at present evaluate the necessity of this rule type.

to interpretable semantic elements but also to uninterpretable ones, and the other is in respect to the nature of semantic and phonetic relations: grouping and ordering.

Intermediate, or uninterpretable, semantic elements are all properties and not relations: they are added by constant-addition-deletion rules in phonetically directed derivations and deleted in reverse derivations; and, together with interpretable semantic elements and relations, they are substituted by phonetic terms by means of the substitution-effecting bimodal rules of the grammar. They do not constitute a separate mode, on a par with the semantic and phonetic mode, since no sentence representation can be given solely in terms of intermediate elements; and they belong conceptually with semantic, rather than phonetic, elements in that they form constituents with semantic, but not with phonetic, elements. Some of them have the interesting property that their labels are identical with interpretable semantic labels e.g. FEMININE. What this means is that the total set of constituents that include the property label FEMININE properly includes a semantic class: the class of semantically feminine nouns.

The nature of the semantic grouping relation is very different from that of the phonetic linear precedence relation. Sanders proposes that linear precedence relations are derivationally invariant, both by token of there being no special rule type that could replace one order by another and also by token of the existing rules of the grammar being applicationally restricted from being able to effect order reassignment (Sanders 1972a, 94-100; Sanders 1969, 1970b). The same does not hold for grouping relations: the adding and altering of grouping relations is permitted both derivationally and also perhaps by a separate rule type (Sanders 1972a, 100-110, 124-125). The derivational invariance of linear precedence relations and the derivational variance of grouping relations appear to correspond to the intuitively satisfying claim that the process of linguistic expression is a re-thinking, rather than re-pronouncing, process and that thought, or conceptual association, is both the content and the medium of linguistic expression, whereas pronounciation, or linear sequencing, is only its means and not its medium.

According to Sanders' hypothesis, of our three syntactic rule schemata (according to the element types involved), all three are needed. In particular, he proposes that variable-addition-deletion rules may be of the type $S_p = S_p$ (Sanders 1972a, 100ff), that there are constant-addition-deletion rules of the type $S_p = S_p S_r$ (Sanders 1972a, 100-110), and that there are also constant-addition-deletion rules of the type $S_p S_r = S_p S_r$.

This concludes our brief survey of the hypotheses concerning what substantive statement types might belong to the necessary and sufficient set of explanatory principles of grammars. Each of these statement types corresponds to a distinctive hypothesis as to what properties and relations are predictable from what other properties and relations in the process of expressing a thought or understanding a sentence. I will now briefly summarize some of the results of this survey.

1. ON THE PREDICATES OF GRAMMATICAL AXIOMS: All substantive grammatical axioms, just like all significant linguistic theorems, are two-place predications of equivalence.

2. ON THE TERMS OF GRAMMATICAL AXIOMS:

a. manner of distinctness of the two representations: All grammatical axioms are either context-sensitive addition-deletions of constants or of variables, or they are context-sensitive substitutions, or they are context-free substitutions (where the labeling of these types reflects the possible uses that can be made of the axioms).

b. interpretability status of elements: All grammatical axioms refer either to interpretable semantic or phonetic terms or to uninterpretable semantic terms.

c. mode of elements:

1. mode of elements included on a single side of the equation: No addition-deletion axiom, whether of constants or of variables, refers to a modally mixed representation.

2. respective mode of elements included in different sides of the equation: No axiom whose two sides are homomodal in comparison with each other can be a substitution axiom.

Having considered the content and form of axiomatic grammatical equations that can be used to prove and thus to explain linguistic theorems, I will next turn to the question of what it takes to actually use them for that purpose; i.e. to the question of how those sequences of equations that are valid proofs with respect to a set of axioms can be differentiated from those equation sequences that are not valid proofs in respect to that set of axioms.

As discussed before, the proof of a linguistic theorem will be defined in Sanders' sense, i.e. that it is an ordered set of equations such that each consists of constants only and no variables, and that one of the two flanking equations is a fully interpretable idempotent equation. Comparing the equations that constitute the set of grammatical axioms of a grammar and the set of equations that constitute a proof associated with that grammar, there are at least three fundamental differences between them:

1. whereas no proof equation refers to variables, most axiomatic equations refer both to constants and variables

2. whereas the inclusion of no particular number of axioms is necessary for a given axiom set, sets of equations constituting proofs have to include more than one and less than infinite equations

3. whereas the inclusion of no particular axiom type is necessary for a grammatical axiom set, sets of equations constituting proofs have to include at least two specific equation types: an interpretable bimodal non-idempotent equation and an interpretable (monomodal) idempotent equation

4. whereas axiom sets are unordered, equations of a proof are strictly ordered, with the interpretable non-idempotent and interpretable idempotent equations being the flanking ones.

A way of appropriately summarizing these differences would be to say that axioms are general, isolated, static laws, whereas a proof is the reflection of a goal-oriented process which starts with something and ends with something and which process is applied to particular things i.e. to (the representations of) actual sentences. The questions therefore that arise are basically these two:

1. how can the truth of an axiom which is a general statement, including reference both to constants and to variables, be brought to bear on the justification of any statement referring to particular linguistic representation consisting of constants only?

2. how could a set of laws, i.e. non-processual statements that grammatical axioms are, justify the processes that constitute proofs?

Answers to these questions can be derived from the cross-scientifically defined concept of constant-constant and variable-constant equivalence relationship and from the logical definition of a particular restricted variable. In particular, the first question is answered by stipulating that from the truth of an axiomatic statement the truth of a theorem can be derived if the representations of the theorem can be analyzed into the representations of the axiom such that all constants mentioned in the theorem are either equal to constants referred to in the axiom or are subsumeable under a variable mentioned in the axiom such that each constant is subsumed under one variable only and that under identical variables identical constants are subsumed. Answer to the second question can be given by recognizing that, following from the general logical definition of equivalence relations, the equivalence predicate which is the predicate of axioms is a restricted variable standing for two optional substitutability instructions. The equivalence statement A = B thus stands for these two statements:

a. A may be substituted for B

b. B may be substituted for B.

Although the Analyzability Condition and the Substitutability Principle are thus seen to insure the applicability of the general truth of axioms to particular linguistic representations and to justify substituting one particular linguistic representation by another, these two principles are not sufficient to characterize sets of equations that are valid proofs with respect to a set of axioms as opposed to those that are not. In particular, whereas the particularness of representations referred to in proofs and the strict orderedness of these equations included in proofs have been accounted for, what has not yet been accounted for is that the strictly ordered equation sequences constituting a proof have both quantitative and qualitative restrictions imposed on them: in particular, a proof must consist of more than one and less than infinite equations and that it has to include as its two flanking equations an interpretable bimodal non-idempotent and an interpretable (monomodal) idempotent equation. The reason why these particular properties of equation sets constituting a proof are not accounted for is that the Analyzability Condition and the Substitutability Principle simply say that if the Analyzability Condition is satisfied, a linguistic representation may be substituted by another. The actual execution of such a substitution is thus permitted by this principle but not required or prohibited. But if substitution is solely governed by this principle there is no assurance that the proof will consist of any line in addition to the initial one since the non-application of an applicable rule is just as consistent with the Substitutability Principle as its application. Similarly, there is no assurance that the proof will ever terminate since the never ending recursive application of rules, which is inconsistent with the concept of a well-formed derivation, is consistent with this principle.[22] In other words, in order to insure that the number of equations is within the limit that determines the number of equations included in a well-formed proof, the permissive principle of substitutability has to be supplemented by principles that have coercive and prohibitive effects--by

---

[22] Such potential infinite loops can arise in at least three ways:
1. one directed subrule of an axiom can infinitely (vacuously) reapply to a representation
2. a set of rules can infinitely reapply to a representation, the rules being a.) either the two differently directed subrules of the same axiom which take turn in reapplying; or b.) sequences of subrules derived from different axioms. It seems to me that whereas the possibility described under 2.a. is a logically necessary source of infinite derivational loops (unless excluded by some principle), the possibilities listed under 1. and 2.b. are contingent properties of grammars.

principles, that is, that specify that under some conditions some rules must not apply.

Furthermore, even if the fulfillment of the quantitative requirement of a proof consisting of a finite number of equations that is more than one were insured by some principles, this would still not be enough to provide a full characterization of the concept "proof of a linguistic theorem." This is because the particular nature of the flanking equations, one of them being a bimodal interpretable equation the other an interpretable idempotent equation, would still not be assured. The converse, however, is not the case: if the particular nature of the flanking equations could be insured then the fulfillment of the constraint on the number of equations that can constitute a proof would also be guaranteed since the fact that there are specified flanking equations prevents an infinite set of equations to qualify as a proof and the fact that there are two distinct specified flanking equations prevents a single equation to qualify.

This consideration suggests that if the Analyzability Condition, and the Substitutability Principle are supplemented by the specification of the flanking equations of a proof, an appropriate characterization of equation sets that constitute valid proofs with respect to a set of axioms is achieved, as opposed to those sets that do not constitute such proofs. This third added inference principle, the Specification of Flanking Equations, simply says that proofs are products of goal-directed thinking; or that in order to prove a theorem one has to start out with that theorem as given, one has to start doing things, and then one has to know where to stop. It is on this goal-directedness that the Maximalization of Terminality principle proposed by Sanders is based on which as mentioned above stipulates that all rules that can contribute to the terminal specification of representations have to apply when they can apply and have to apply in such a manner as to actually make this contribution.[23] This principle directly determines the obligatoriness and properly directed use of many grammatical axioms, most obviously of lexical substitutions.

Although the three inferential principles adopted so far are now able to distinguish proofs from non-proofs from the point of view of the fundamental formal properties of proofs, i.e. to account for the variable-free, ordered, and terminally well-formed nature of proofs, further inferential principles are nonetheless needed. This is because there are cases where these principles characterize more than one single derivational

---

[23] For a formal definition and discussion of this principle, see Sanders 1972a, 89ff and passim.

step as equally valid, although not all of these steps turn out to be steps included in well-formed derivations--i.e. not all turn out to be empirically valid. Such empirically significant but so far unrestricted rule applicational choices arise in the following two basic ways:

1. Given a linguistic representation, the set of grammatical axioms includes one axiom from which more than one legitimate substitution can be derived by the alternative interpretation of the unrestricted and/or restricted variables referred to in the axiom; in particular, a) either by alternative analyses of unrestricted variable--i.e. one of the two directed substitutions derivable from the axiom has as its input a representation into which the given representation can be analysed in more than one way b) or by alternative analyses of unrestricted and restricted variables--i.e. both of the two directed subrules derivable from the axiom have as their inputs representations into which the given representation can be analyzed.

2. Given a linguistic representation, the set of grammatical axioms includes more than one axiom from which a legitimate substitution process can be derived with respect to that given representation. Since the Analyzability Condition says that any substitution step is legitimate where a representation is substituted by another such that the two representations can be analyzed into two sides of an axiom, either member of the binary (or multiple) choices listed above would receive equal validity characterization by this principle; but since empirically these alternatives do not turn out to be equally valid in all cases, additional principles are needed to characterize the empirically correct choices.[24]

Principles to determine such choices could of course be given by simple rule-specific and language-specific enumeration of the necessary constraints, since empirically this is all that is needed. The theory of equational grammar, however, includes the claim that all rule-applicational principles have to be universal. The prediction that such universal principles do in fact exist, which when first made[25] was a prediction not only in a logical but also in a heuristic sense, has been substantiated by much research in the past few years.[26] The discovery of such principles makes

---

[24] The arisal of such choices and their empirical non-equivalence again seems to be non-necessary and thus contributing to the characterization of natural languages. One source of the multiple application of the same subrule to a representation is of course the existence of coordinated and embedded structures.

[25] Compare Sanders 1967 and especially 1972a, written, as noted in its preface, in 1968-1970.

[26] For a summary, interpretation, and formalizability of such recently discovered principles, see Sanders 1973.

universal

it thus possible to characterize the knowledge that it takes to apply linguistic rules for the purposes of proofs, or derivations, as a body of principles distinct from the knowledge of the rules themselves and related to general principles of goal-directed human behavior (Sanders 1972a and 1973).

All of this has been an attempt to provide a principled framework to view and then explain observations about object-verb agreement. Having now stated some general assumptions about the nature of observable linguistic properties, about the nature of linguistically significant observations and about the explanations of linguistic observations and having surveyed some empirical hypotheses concerning the nature of explanatory principles, we will now return to the consideration of agreement. The relation of agreement to observable facts of language and the significance of the phenomenon of agreement will be discusses in the next two sections (2.1 and 2.2); explanatory principles that justify the assumption of abstract agreement representations will be discussed in sections 2.3 and 2.4; and the use of the grammar thus emerging will be illustrated in section 2.5.

2. The description of object-verb agreement

2.1. Prelexical representation

As was stated in the preceding section, observationally, sentences are pairs of symbolically equivalent phonetic and semantic representations. Since we have accepted as the goal of the grammar to explain in terms of general principles of symbolization why particular meanings and particular sounds are symbolically equivalent, it must be that the grammar includes some principles whereby the direct symbolic equivalence of a phonetic and a semantic representation can be shown. As we have seen above, what characterizes natural language grammars is that the heteromodal representations that are observed to be in direct symbolic equivalence relationship and the heteromodal representations that the grammars show to be directly equivalent are not the same: the heteromodal representations that can be observed to be directly equivalent are shown by the grammar to be indirectly equivalent and the heteromodal representations that the grammar shows to be directly equivalent are not observable. Saying that a grammar includes in addition to lexical rules also syntactic and phonological rules is a formal recognition of this basic characteristic of natural language grammars.

The representations of a sentence in terms of which it is characterized in the grammar, arranged in order of their relative distance to semantic and phonetic reality, can be diagrammed as follows:

R^{I}_{s}	$R^{A}_{s_1} R^{A}_{s_2} R^{A}_{s_3} \ldots R^{A}_{s_n}$	$R^{A}_{p_1} R^{A}_{p_2} R^{A}_{p_3} \ldots R^{A}_{p_n}$	R^{I}_{p}
interpretable semantic representation	syntactic, or abstract semantic, representations	phonological, or abstract phonetic, representations	interpretable phonetic representation

The two observational, or directly interpretable, representations are at two ends. The two "most abstract" representations--i.e. those most remote from observable reality in terms of the number of derivational steps that intervene--are in the middle of the diagram. The symbolic equivalence of representations within each of the two, semantic and phonetic, modes is expressed by the syntactic and phonological transformational rules of the grammar. The two most abstract representations within each mode are equated by the lexical, or "transfigurational", rules.

To say that a sentence property is observational means to say that that property is part of the interpretation of one of the two directly interpretable representations of a sentence. To say that a sentence property is abstract means that it is expressed in a representation that is not one

of the two observational ones. What it takes, therefore, to answer the question: "What is agreement in relation to the observable reality of language?" is to consider which are representations of a sentence that provide a formal characterization of intuitively recognized agreement relations.

Verb-object agreement, and verb agreement in general, is clearly not an observational phonetic property of sentences. This is because the statement "this verb agrees with its object" involves terms such as "verb" and "object" that do not correspond to phonetic property labels and since the relation "agrees" that is predicated of them is not a relationship that corresponds to the only relation that exists on the observational phonetic level, i.e. to linear precedence.

It is also equally clear that verb-object agreement is not an abstract phonological property of sentences, either, since the terms and relations that it involves cannot be represented in terms of representations that consist of any arrangement of any set of phonetic property labels.

We will therefore turn next to the consideration of which semantic representations represent agreement the way we intuitively understand it. Moving away from phonetic reality toward semantic observations, we will, first, consider the most abstract level of semantic representations which is what might be called, in phonetically directed derivations, the prelexical (or, in semantically directed proofs, the post-lexical) representation. In the next section we will then consider interpretable semantic representations of sentences with agreement.

As our basic set of data, let us take some sentences of MODERN GREEK, a language with subject, direct object, and indirect object agreement. A MODERN GREEK sentence that manifests both subject and direct object agreement is o Petros me filise emena, a simple translation equivalent of the ENGLISH sentence Peter kissed me.[27] Disregarding stress and intonation, for which I have no information, and considering each orthographic symbol as standing for a set of phonetic property labels, the phonetic properties of this string are exhaustively enumerated by listing the set of orthographic symbols that it consists of and specifying their linear sequence.

A. constituent set: o, p, e, t, r, o, s, m, e, f, i, l, i, s, e, e, m, e, n, a

B. linear sequence of constituents: o& p &e& t& r& o &s& m& e& f &i &l &i &s &e& e& m &e& n& a

---

[27] All MODERN GREEK examples, together with their transliterations, come from Drachman 1970. Spaces have no phonetic value.

This description provides for the sufficient set of phonetic properties for a sound string to have if it is to convey the meaning 'Peter kissed me' in MODERN GREEK. Let us now investigate the necessary set of such properties. In other words, to what extent can the limits of this segment set and their sequential restrictions be broken without destroying the specific symbolic value of the string?

As far as the segment set involved is concerned, additional data indicate that whereas no additional segment is permitted--strings such as o Petros me me filise emena or o Petros me filise emena Sokrates do not mean 'Peter kissed me.'--there is limited freedom in omitting some of the segments. In particular, although strings such as o me filise emena or o Petros me fi emena do not mean 'Peter kissed me.', o Petros me filise and o Petros filise emena do mean that. As far as freedom in ordering segments is concerned, again there are some possible meaning-preserving alternatives. Thus, whereas strings such as o sortep me filise emena, o Petros emena filise me, o Petros me emena filise, o Petros filise me, and o Petros emena filise all belong to the vast set of sequential variants that do not mean 'Peter kissed me.', the sequential variant o Petros emena me filise does mean that.

We now have found that there are actually four sound strings in MODERN GREEK that all convey the meaning 'Peter kissed me.' and which differ from each other in some of the phonetic segments that they include and in some of the orderings of the segments. These four strings are the following:

o Petros me filise emena
o Petros emena me filise
o Petros me filise
o Petros filise emena.

Comparing these sound strings with other sound strings that do not convey this meaning, the following statement can be made about the necessary and sufficient set of phonetic properties of MODERN GREEK sound strings that mean 'Peter kissed me.'[28]

A. constituent set: the string must contain (o, p, e, t, r, o, s, f, i, l, i, s, e) and either or both of the following sets: (m, e) and (e, m, e, n, a).

---

[28] Although I have no data to support this, it is certain that these properites are not all necessary and that there are further members of this synonymy set structurally corresponding to ENGLISH sentences such as Peter gave me a kiss., I was kissed and it was Peter who did it. etc.

B. linear sequence of constituents:

a) the set (f, i, l, i, s, e) and the set (m, e) are ordered as (m, e) preceding (f, i, l, i, s, e)

b) the set (m, e) & (f, i, l, i, s, e) and the set (e, m, e, n, a) are ordered (e, m, e, n, a) either preceding or following (m, e) & (f, i, l, i, s, e)

c) the set (f, i, l, i, s, e) and the set (e, m, e, n, a) are ordered as (f, i, l, i, s, e) preceding (e, m, e, n, a)

d) the set (o, p, e, t, r, o, s) precedes everything else

e) the set (o, p, e, t, r, o, s) is ordered as (o & p & e & t & r & o & s)

f) the set (f, i, l, i, s, e) is ordered as (f & i & l & i & s & e)

g) the set (e, m, e, n, a) is ordered as (e & m & e & n & a)

h) the set (m, e) is ordered as (m & e).

The question now arises as to why the expressions of the meaning 'Peter kissed me' require just these constituents and in just these orders--i.e. what specific contribution the constituent sets and their sequence make to the effective expression of this meaning. Having already excluded the possibility that some of these segments and sequential restrictions may not be predictable from anything--i.e. that they would be free variants--and apart from the possibility that some segments and some orders may be predictable from other segments and other orders whose possibility will not be considered here, the remaining alternatives are determined by whether all or some of these segments and their sequential restrictions correspond to some separate semantic element; or whether all or some of these segment sequences jointly correspond to some meaning.

Consideration of further sentences of MODERN GREEK indicate that some of the phonetic segments individually and other segments jointly occur consistently whenever some semantic element is part of the understood meaning of the sentence. For instance, o consistently corresponds to the definiteness of masculine singular subject nouns, but f or il correspond to no meaning; however, f, jointly with i, l, i, s, e, and ordered as filise, always corresponds to the meaning '(somebody in the third person) kissed (someone)'. Taking into consideration these systematic sound-meaning correspondences, the restrictions noted above as to what is the necessary and sufficient segment set involved in the expression of 'Peter kissed me.' can now be restated as follows:

'definite singular masculine subject determiner' = o

'singular animate masculine subject noun, the name Peter' = (P, e, t, r, o, s)

'past verb with animate subject and concrete object, kiss' = (f, i, l, i, s)
'singular subject pronoun' = e
'speaker, object pronoun' = either (e, m, e, n, a), or (m, e), or both.

Now, let us explore the appropriate formulation of the sequential restrictions on the segments. Although, observationally, all that we can ever perceive is one phonetic segment following another, it has now become obvious that whereas some such observed sequential restrictions lend themselves to being stated only as restrictions on the order of phonetic segment sets in the expression of some meaning, others could in principle be stated either as restrictions on the order of phonetic segment sets in the expression of some meaning or as restrictions on the order of meaning elements that these phonetic segment sets correspond to. An example of the former is the order of f and i in filise which has to be stated as a restriction on the order of f and i when they are part of the expression of the meaning of 'kissed'. An example of the latter is the order of o and of (P, e, t, r, o, s) which can be stated either by saying that for the expression of 'the (person called) Peter', o has to precede (P, e, t, r, o, s), or that for the expression of 'the (person called) Peter' the segment set corresponding to 'the' has to precede the segment set corresponding to '(person called) Peter'. The two alternative statements are thus the following:

1.a) '(the person called) Peter' is expressed by the association of the form of 'the' and of the form of 'Peter'
b) 'the' = o
c) '(person called) Peter' = (P, e, t, r, o, s)
d) (o) and (P, e, t, r, o, s), in the meaning '(the person called) Peter' are ordered as (o) & (P, e, t, r, o, s).

2.a) '(the person called) Peter' is expressed by the association of the form of 'the' and of the form of '(person called) Peter'
b) ('the') and ('(person called) Peter') are ordered as ('the') & ('(person called) Peter').
c) 'the' = o
d) '(person called) Peter' = P, e, t, r, o, s .[29]

---

[29] The third logical alternative of ordering o and (P, e, t, r, o, s) would be to order them in reference to their phonetic properties only, rather than in reference to their semantic properties only (2. above) or in reference both to their semantic and phonetic properties (1. above):

3.a) 'the (person called) Peter' is expressed by the association of the form of 'the' and the form of '(person called) Peter'.
b) 'the' = o
c) '(person called)Peter' = P, e, t, r, o, s
d) The order of o and p (or that of o and (p, e, x, y); or that of o and (p, e, t, x, y) is o & p (or o & (p, e, x, y)/or o & (p, e, t, x, y).

There is a conceptual difference between the two alternatives, in that the first statement (and also the third noted in the footnote) is an observational one predicating linear precedence relation with respect to phonetic segments that can be observed to have such relations, whereas the second alternative statement departs from observational reality in that it predicates linear precedence relationship, which is a phonetic relation, of elements that are not segments of sound but segments of meaning. The question now arises as to which alternative should be chosen. Although it is logically possible that an ordering rule would have to refer to phonetic properties of constituents only, or to both phonetic and semantic properties of constituents[30], in this case, an ordering rule ordering semantic constituents is the one that has general application with respect to MODERN GREEK, since determiners other than o and nouns other than Petros are also always ordered as the determiner preceding the noun. The same considerations hold for the ordering of o Petros in respect to the rest of the sentence and for the ordering of e, me and emena with respect to filis. The optimal restatement of the observed sequential restrictions, together with an appropriately reformulated lexicon, is thus provided by the following:

a. The subject precedes the verb.

b. The short object pronoun precedes the verb.

c. The short subject pronoun follows the verb.

d. The long object pronoun follows the verb, unless there is also a short object pronoun present in which case it may precede that.

e. The determiner precedes the noun.

f. 'noun, subject, singular, masculine, name, Peter' is expressed by P & e& t &r &o& s.

g. 'determiner, definite, subject, singular, masculine' is expressed by o.

h. 'verb, past, animate subject, concrete object, kiss' is expressed by f &i &l &i &s.

i. 'singular short subject pronoun' is expressed by e.

j. 'speaker, short object pronoun' is expressed by m & e.

k. 'speaker, long object pronoun' is expressed by e & m & e& n &a.

We have thus established a set of rules that appear to be sufficient and necessary to show direct correspondence between phonetic properties and relations of the MODERN GREEK sentences o Petros me filise emena,

---

[30] The case of clitic ordering in TAGALOG described by Schachter (Schachter 1973) and some aspects of RUSSIAN and HEBREW ordering described by Hetzron (Hetzron 1972) may be instances of this sort.

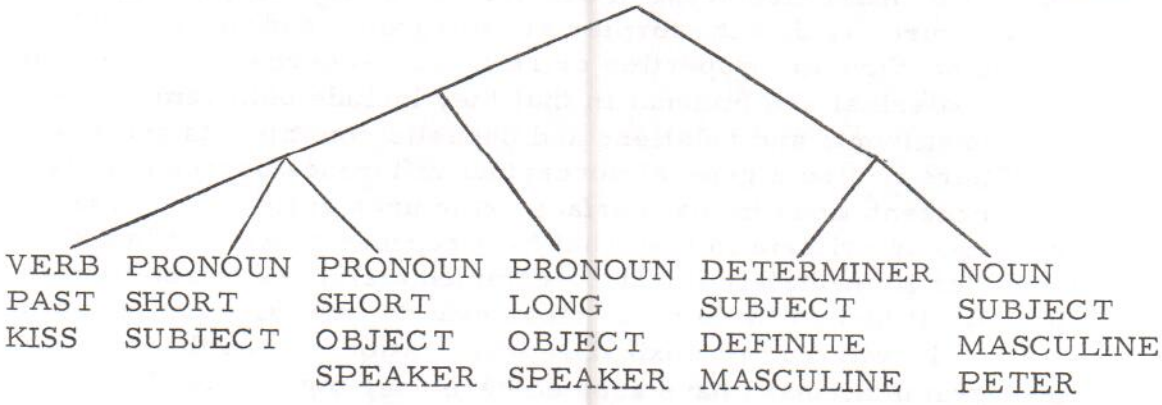
o Petros me filise, o Petros emena me filise, o Petros filise emena and a set of semantic properties and relations. The question that now arises is what representation these rules apply to in phonetically directed derivations. There are two requirements with respect to this representation. First, the representation should include mention to all semantic property labels that are mentioned in the lexical and ordering rules. In particular, it has to include property labels such as NOUN, SUBJECT, PETER, DETERMINER, DEFINITE, VERB, KISS, PRONOUN, OBJECT, etc. Second, these property labels have to be structured in some manner. In particular, there appears to be evidence both for the necessity of property labels to be structured into groups and also for these groups to be structured into further groups. Evidence for the necessity of grouping of property labels comes both from lexical rules proper and from ordering rules. First of all, in order for the lexical rules to apply properly, it has to be made clear in the representation to which they apply which property labels are to be lexicalized together. For instance, given a representation that includes the property labels SUBJECT, PETER, OBJECT, MARY, there is no way of deciding which name should be lexicalized with which case property unless each name is grouped together with its own case label such as (SUBJECT, PETER), (OBJECT, MARY). Second, such grouping is also necessary if ordering rules are to be stated most generally. If the property labels were not grouped, ordering rules would have to mention all properties whose expression is to be ordered in relation to the expression of another set of properties rather than just mentioning the properties relevant to ordering. For example, the determiner ordering rule mentioned above according to which determiners are ordered before their nouns could not be stated in its most general form such as this: (DETERMINER, X), (NOUN, Y) = (DETERMINER, X) & (NOUN, Y), but in the place of the variable it would have to mention all specific properties of the determiners and of the nouns that are being ordered and would thus lose all generality.

Further generality can be achieved for ordering rules if groups of property labels are assumed to be further grouped--i.e. if groups are assumed not all to be coordinate with respect to each other but some assumed to be subordinate to others. In particular, Sanders (1969,1970b) showed that assuming that some but not all constituents are sisters to each other and that ordering rules order only constituents that are sisters of each other, a given ordering rule can be used to order both a single constituent with respect to another single constituent that is sister to it and also a non-unary set of sister constituents with respect to another non-unary set of sisters such that the two sets are sisters to each other. He uses, for instance, a rule that orders verbs before ob-

jects both to order single constituents whose property labels include the labels VERB and OBJECT and also to order multiple-constituent sister sentences (i.e. conjuncts) whose constituents include, among others, a verbal and an object constituent.

From these general considerations about the properties of prelexical representations, certain specific consequences concerning the prelexical representation of the MODERN GREEK sentences follow. First, as already mentioned, it has to include all semantic property labels that lexical and ordering rules refer to. The grouping of these labels has to correspond to the size of orderable constituents; e.g. VERB and KISS will have to belong to the same group; and the groupings of the resulting constituents has to be such that the ordering rules can apply to them. In particular, the subject and object agreement marker constituents should be represented as orderable with respect to--i.e. sister to--the verb; the determiner should be sister to its noun; the object should be sister to the constituent consisting of the verb proper and the two agreement markers; and the subject should be sister to the constituent that consists of the verb, including the agreement markers, and the object.

According to these considerations, the prelexical structure of the sentences o Petros emena me filise and o Petros me filise emena has to be the following: ((((VERB, PAST, KISS), (PRONOUN, SHORT, SUBJECT) (PRONOUN, SHORT, OBJECT, SPEAKER)) (PRONOUN, LONG, OBJECT, SPEAKER)) ((DETERMINER, SUBJECT, DEFINITE, MASCULINE) (NOUN, SUBJECT, MASCULINE, PETER))): or, graphically:[30a]



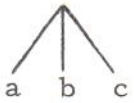
[30a] Parentheses, or tree branches, represent commutative grouping relations (cf. Sanders 1972a, 94f). The prelexical constituent status of verbal tense and nominal gender, number, and case is neglected throughout this section.

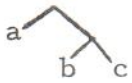
Each unary branch in this tree defines a set of properties that are jointly lexicalizable but that are not orderable with respect to each other. Each set of sister branches define sets of property labels that are orderable with respect to each other but that are not all jointly lexicalizable. Each pair of non-sister branches defines property sets that are neither jointly lexicalizable nor orderable with respect to each other. The relations that the tree thus defines among property labels is the relation "formally related to each other" and "formally not related to each other", where "formally related" means either "jointly made essential reference to in a lexical rule proper" of "jointly made essential reference to in an ordering rule". All in all, by including a set of semantic properties and relations that are necessary and sufficient to ensure the proper application of the lexical and ordering rules as formulated, the tree explicitly shows just what semantic properties and relations of a sentence can be shown to be directly equivalent to some set of phonetic properties and relations of that sentence.[30b]

It is easy to see that non-occurring orders are excluded in two different ways: either by token of structure, or by token of ordering rules.

[30b] The representation called here prelexical corresponds to some extent to syntactic surface structures in the standard theory of transformational generative grammar in that both structures are those non-phonological (or, in transformational grammar, not exclusively phonological) representations that are derivationally adjacent to a phonological (or, in transformational grammar, predominantly phonological) representation. The difference between our prelexical representations and surface structures is that the former are prelexical and monomodal--i.e. include no phonetic properties or relations--whereas surface structures are postlexical and bimodal in that they include both semantic-syntactic constituents and relations and phonetic constituents and relations. There is also a general conceptual difference between the two kinds of representations in that surface structures seem to me to lack explicit adequacy criteria in that what they represent has been taken to be "given", or immediately (or almost immediately) observable; but to my knowledge it has not been made clear exactly what kinds of observations bear on it; whereas prelexical representations in the theory of equational grammar that I have adopted here are, together with (immediately) postlexical phonological representations, the most abstract sentence representations whose adequacy criterion is how well they provide for the applicability of optimally general lexicalization and ordering rules. For some discussion of some deficiencies of the concept "surface structure", see Hetzron 1973.

For instance, the linear precedence of 'Peter' over 'the' is excluded because the ordering rule orders these two constituents the opposite way; and the immediate linear precedence of 'the' over 'kissed' is excluded, together with its immediate linear subsequence, by token of the structure which characterizes them as non-orderable.[31] These considerations indicate that structures with fewer sister constituents (i.e. fewer coordinate branchings) provide for a more restrictive characterization of possible linear precedence relations. To see this clearly, compare three constituents arranged in two structural patterns:

A: 

B: 

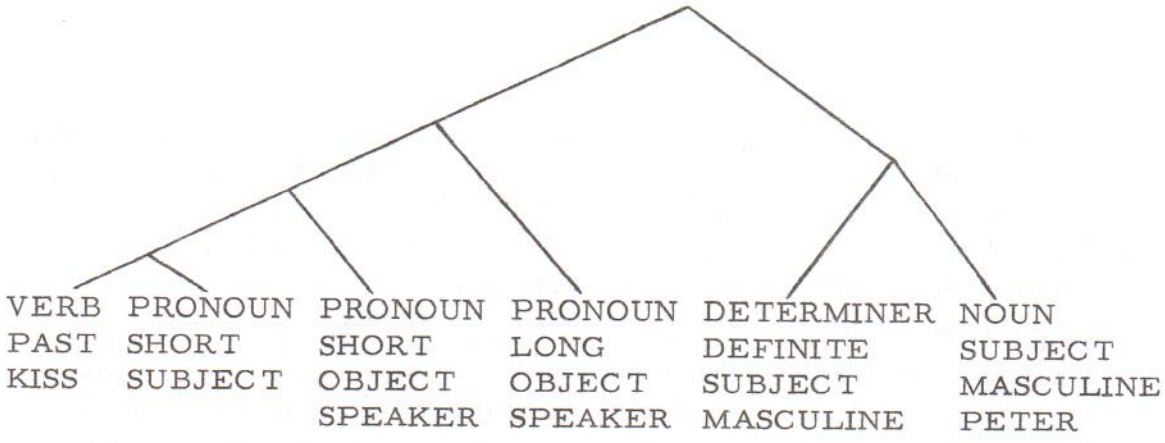
Structure A, with ternary coordinate branching, allows for six ordering rules and thus for all six of the possible orderings of the three constituents: abc, acb, bac, bca, cab, cba; whereas Structure B allows only for four ordering statements: (a), (b, c) = (a) & (b, c); (a), (b, c) = (b, c) & (a); (b), (c) = (b) & (c); (b), (c) = (c) & (b); and thus for only four orders: abc, acb, bca, cba; but not for bac and cab.

In the light of these considerations, we will attempt to alter the structure thus far proposed for the sentences Petros me filise emena and Petros emena me filise by reducing the ternary branching that it involves into binary branching. The present structure would allow for six different orderings of the verb and the two short pronouns; in reality, we have seen so far only one of this realized: the short object pronoun preceding the verb and the short subject pronoun following. This means that there is no non-arbitrary way of reducing the ternary branching into binary branching, since both the grouping together of the verb and the subject pronoun as opposed to the object pronoun; and the grouping together of the verb and the object pronoun to the exclusion of the subject pronoun would allow for the prediction of the attested order of these three constituents (although the third possibility, the grouping of the two pronouns as against the verb would not and is therefore excluded as a prelexical structure). Further data, however, indicate a non-arbitrary choice between the two possible structures. Drachman points out that in imperative sentences

---

[31] This also holds for non-occurring lexicalization patterns. For instance, the fact that 'the' and 'kissed' are not jointly lexicalized is a function of prelexical structure in that they do not belong to the same constituent; and the fact that 'the' is lexicalized into o, rather than into something else, is a function of a particular lexical rule.

the short object pronoun must follow, rather than precede, the verb.[32] Since therefore the structure has to allow both for the ordering of the short object pronoun to precede the verb and the short subject pronoun (in non-imperative sentences) and for it to follow the verb and the short subject pronoun (in imperative sentences); and since the structure where the short object pronoun and the verb are sisters to each other and are jointly sisters to the short subject pronoun does not allow for both of these orders, but the structure in which the subject pronoun and the verb are sisters to each other and they are jointly sisters to the object pronoun does, the latter has to be chosen. The revised tree is therefore the following:[33]


VERB PRONOUN PRONOUN PRONOUN DETERMINER NOUN
PAST SHORT SHORT LONG DEFINITE SUBJECT
KISS SUBJECT OBJECT OBJECT SUBJECT MASCULINE
SPEAKER SPEAKER MASCULINE PETER

---

[32] Drachman 1970, 7, 27; e.g. dose mu to to krasi emena "give-you me it the wine me" (or dose to mu to krasi emena) 'Give me the wine!' (compare *mu to does to krasi emena, *to mu dose to krasi emena, *to dose mu to krasi emena).

[33] To the extent that prelexical structures involve binary branching only, these structures define adjacency with respect to constituents since all sisters will end up as adjacent to each other after the phonetically directed application of some ordering rule (although not all adjacent constituents, of course, will have been sisters in prelexical structure). One kind of structure that may require multiple branching representation is multiple conjuncts. As pointed out by Sanders (Sanders 1970b, 495), the assumption that ordering rules apply to sister constituents has been made informally in traditional grammars. The assumption that some constituents are consistently ordered with respect to particular constituents seems to be implied by such expressions as "This language has preposed adjectives." or by terms such as "preposition", "postposition" where it is taken to be understood that adjectives and case markers are ordered

Further relevant sentences of MODERN GREEK and their prelexical structures are the following:

1. o Petros me filise
   "the Peter me kissed-he"
   'Peter kissed me.'

2. o Petros filise emena
   "the Peter kissed-he me"
   'Peter kissed me.'

3. o Petros skotose ton liko
   "Peter killed-he the wolf"
   'Peter killed the wolf.'

4. o Petros ton skotose ton liko
   "the Peter him killed-he the wolf"
   'Peter killed the wolf.'

5. o Petros ton liko ton skotose
   "the Peter the wolf him killed-he"
   'Peter killed the wolf.'

6. *o Petros ton liko skotose

7. o Petros skotose kapion liko
   "the Peter killed-he some wolf"
   'Peter killed some wolf.'

8. *o Petros ton skotose kapion liko

9. *o Petros kapion liko ton skotose

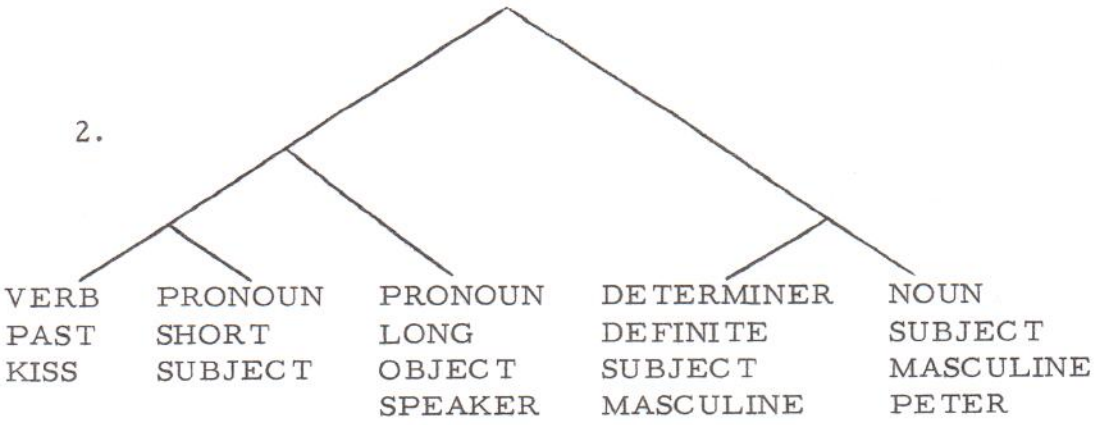
10. *o Petros kapion liko skotose[34]

1.

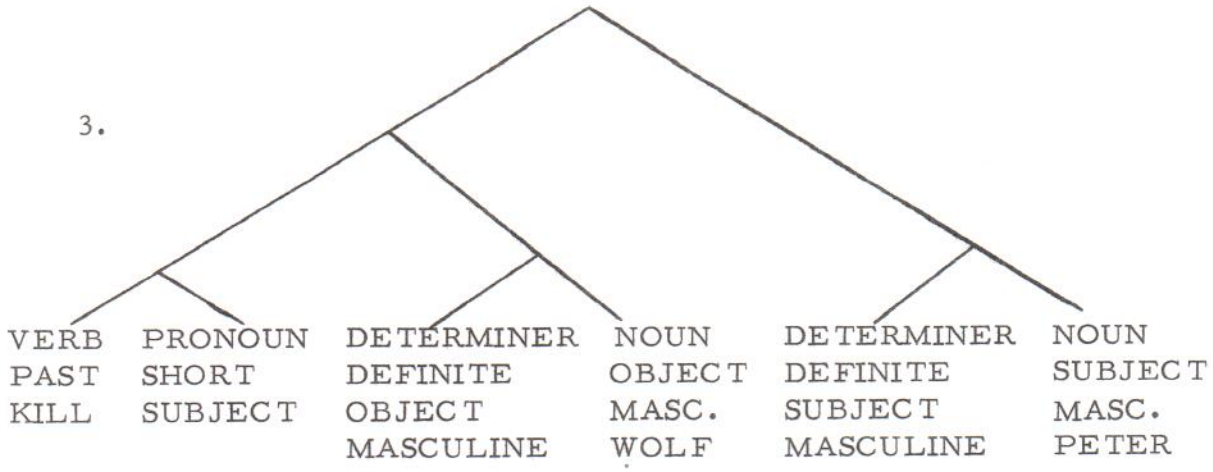
(Footnote 33 continued)
with respect to nouns. The same implicit assumption both in relation to ordering and to stress assignment is revealed by terms such as "enclitic", "proclitic", "suffix", "affix". It is also true, however, that many informal ordering statements traditionally made do not conform to the present assumptions in that some state order restrictions with respect to non-adjacent constituents (such as "The antecedent precedes the pronoun." or "The subject is sentence-initial.").

[34] From Drachman's data I am actually not sure whether a sentence like this would or would not be grammatical.

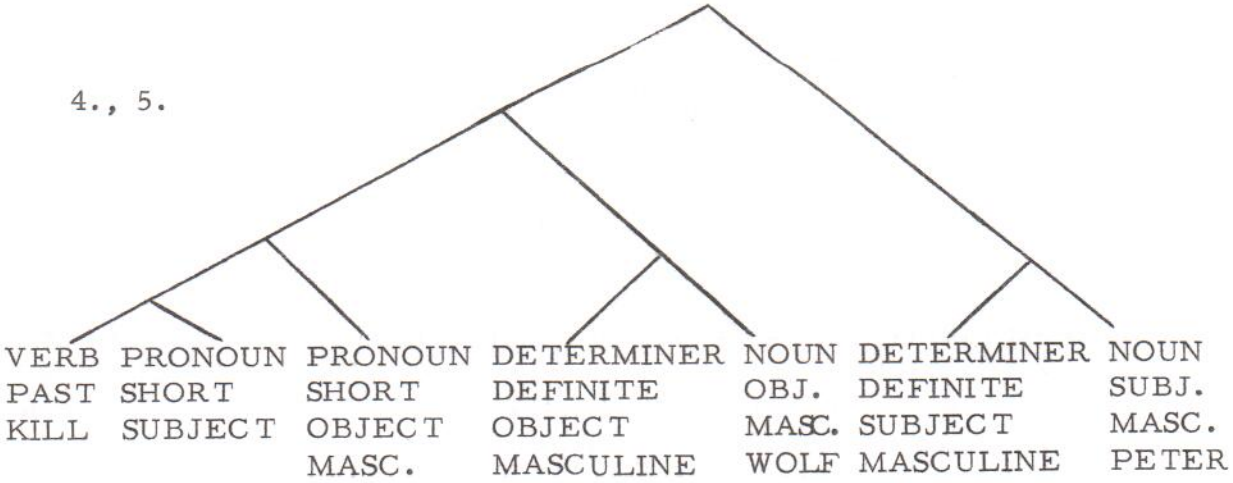
2.


VERB
PAST
KISS
PRONOUN
SHORT
SUBJECT
PRONOUN
LONG
OBJECT
SPEAKER
DETERMINER
DEFINITE
SUBJECT
MASCULINE
NOUN
SUBJECT
MASCULINE
PETER

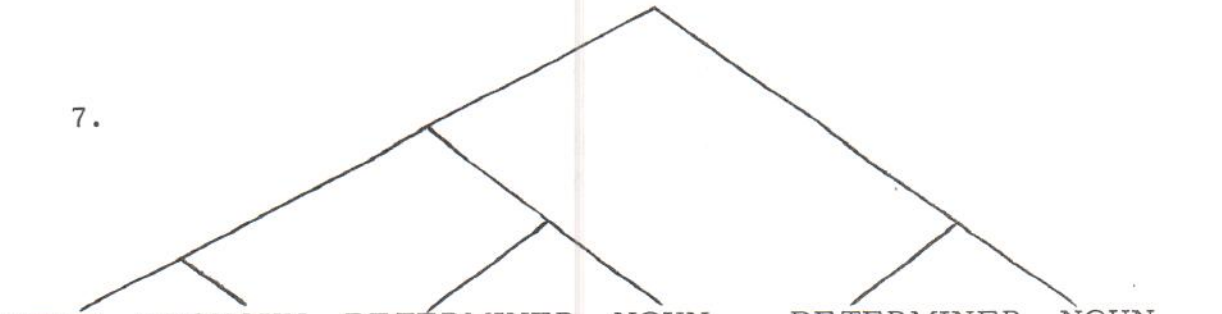
3.


VERB
PAST
KILL
PRONOUN
SHORT
SUBJECT
DETERMINER
DEFINITE
OBJECT
MASCULINE
NOUN
OBJECT
MASC.
WOLF
DETERMINER
DEFINITE
SUBJECT
MASCULINE
NOUN
SUBJECT
MASC.
PETER

4., 5.


VERB
PAST
KILL
PRONOUN
SHORT
SUBJECT
PRONOUN
SHORT
OBJECT
MASC.
DETERMINER
DEFINITE
OBJECT
MASCULINE
NOUN
OBJ.
MASC.
WOLF
DETERMINER
DEFINITE
SUBJECT
MASCULINE
NOUN
SUBJ.
MASC.
PETER

7.



Having now discussed what the most abstract semantic representation of a sentence has to look like, let us consider whether agreement is manifested in such representations. The answer is yes. In particular, subject-verb agreement is represented by the fact that the prelexical representation includes a constituent that is the only sister of the verb and that consists of property labels all of which are also property labels included in the subject constituent, except for SHORT (and PRONOUN which is not a property of the subject if the subject is a noun). Object agreement is represented by the fact that prelexical representations include a constituent that is the only sister of the constituent consisting of the verb and the subject agreement marker and whose properties are all included in the properties of the object constituent, except for SHORT (and PRONOUN, which is not a property of the object if the object is a noun).[35] The lack of verb agreement, on the other hand, is represented by the fact that the verb has no sister constituent in prelexical representation that is labeled SHORT, PRONOUN. These structures thus appropriately formalize the intuitive concept of agreement.

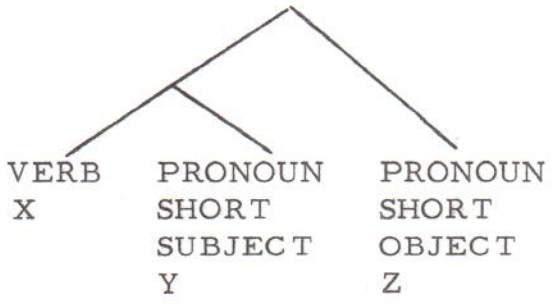
Prelexical structures justified for sentences with object-verb agreement of other languages such as LEBANESE and SYRIAN ARABIC, ZULU, SPANISH, HUNGARIAN, SWAHILI, and AMHARIC, appear to be very similar. In particular, independently motivated prelexical representations of sentences from these other languages would also include a constituent whose specific features are included among the features of the object constituent of the sentence and which is coordinate to a constituent that includes the verb. Representations of such sentences in other languages

---

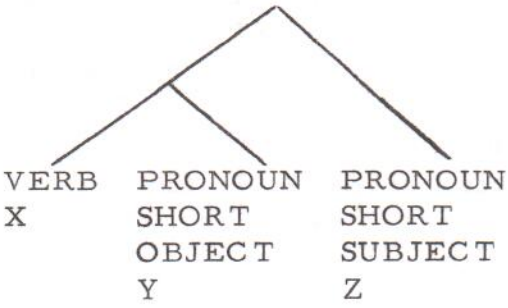
[35] As mentioned before, in MODERN GREEK the verb may also agree with indirect objects, but I do not have enough data on the ordering of such sentences to propose prelexical representations for them. For some examples of such sentences, see Drachman 1970, 6f and 27.

will differ, however, in two ways: in respect to what exactly the object agreement marker is sister to and in respect to what the object itself is sister to. From evidence concerning the ordering of the object agreement marker, all four of the logically possible prelexical structures are justified:

A.

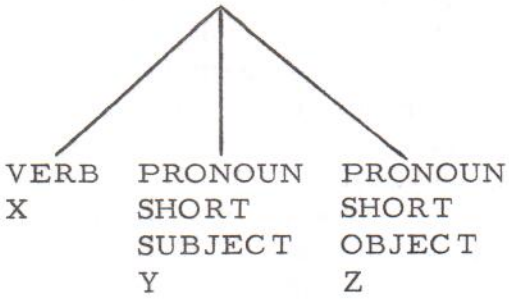


B. a)

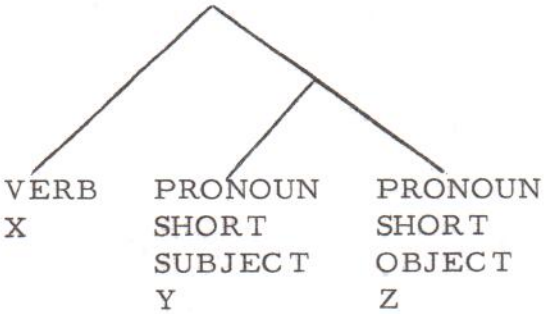


or:

b)



C.



Of these, A. is justified, in addition to MODERN GREEK, also for LEBANESE and SYRIAN ARABIC, AMHARIC, and WALBIRI, since in these languages the object agreement marker is never adjacent to the verb, the order being fixed as Verb followed by Subject Agreement Marker followed by Object Agreement Marker; and for SPANISH since here, as in MODERN GREEK, the order is Object Agreement Marker followed by the Verb followed by the Subject Agreement Marker; but in imperative sentences the object agreement marker follows the verb and the subject agreement marker. In SWAHILI and ZULU, the two BANTU languages in my sample, the order is Subject Agreement Marker followed by Object Agreement Marker followed by the Verb, and thus either B.a. or B.b. has to be assumed. Finally, in HUNGARIAN, the subject and the object agreement markers jointly constitute a portmanteau morpheme and thus there is no evidence to assume that they bear independent relationship to the verb.[36]

As far as the linear position of the object is concerned, agreed-with objects tend to be preverbal, as noted in the previous section and in some cases even pre-subject. In LEBANESE ARABIC, for instance, all the examples given in Koutsoudas 1967 of agreed-with unmarked objects are pre-subject (OSV). In ZULU, depending on some pragmatic conditions the agreed-with object is either immediately preverbal or pre-subject,

---

[36] For some example sentences, compare the following:

WALBIRI (Hale 1973, 328):
ŋalipa-l̥u ka-l̥ipa-tjana wawiri-patu nja-nji
"we-ergative present-we-them kangaroo-paucal see-nonpast"
'We see the several kangaroos.'
(In WALBIRI, it is the auxiliary, rather than the verb itself, that agreement markers are associated with.)

SWAHILI (Givon 1974):
kikopo, ni-li-ki-vunja "cup I-tense-it-break"
'I broke the cup.'
vikopo, no-li-vi-vunja "cups I-tense-them-break"
'I broke the cups.'

ZULU (Kunene 1973):
ikati umfana u-ya-li-thanda "cat boy he-tense-it- like"
'The boy does like the cat.'

HUNGARIAN (my own data):
szeretem Maryt "like-I-her Mary-accusative"
'I like Mary.'
szereted Maryt "like-you-her Mary-accusative"
'You like Mary.'
szereti Maryt "like-he-her Mary-accusative"
'He likes Mary.'

and the same holds for AMHARIC. In prelexical structure, the object may in principle be sister either to the verb, or to the object, or to the whole sentence. These three possibilities allow and disallow the following relative orderings of the object:
a. (O, V) allows for SOV, SVO and disallows OSV
b. (O, S) allows for SOV, OSV and disallows SVO
c. (O, Σ) allows for OSV, SVO and disallows SOV. Accordingly, for LEBANESE ARABIC, for instance, it has to be assumed that the object is sister to the subject or that it is sister to the sentence; but not that it is sister to the verb as in MODERN GREEK; and in ZULU, if the immediately preverbal and pre-subject orderings are to be derived from the same underlying prelexical structure, the object would have to be sister to the subject, but not to the sentence or to the verb.

As a result of these considerations concerning the prelexical structure of sentences with object-verb agreement in various languages, we may conclude that the traditional concept of object-verb agreement can be formally and sentence-and-language-invariantly characterized in the following manner:
Informal claim: In sentence a (where a is a phonetic string) of language L, the verb agrees with its direct object.
Formal characterization: The grammar of L can be used to prove the sentencehood of a (that is to say, a's symbolic equivalence with some meaning A) such that at least one of the lines in the proof--in particular, the immediately prelexical line, in phonetically directed derivations, and the immediately postlexical line in semantically directed derivations--refers to a representation that can be analysed as follows:
(((VERB, X) (PRONOUN, SHORT, OBJECT, Y) Z) (NOUN, OBJECT, Y, W) Q).[37]

In other words, the grammar shows the verb agreeing with the direct object if its rules can be used to predicate indirect symbolic equivalence between the terminal phonetic representation of the sentence and at least one other representation such that that representation includes an object constituent, a verb constituent, and a third constituent grouped with the verb but not with the object which includes the properties OBJECT, PRONOUN, and SHORT and whose other properties are all included among the properties of the object constituent.

---

[37] This can be generalized to provide a schema for any instance of verb agreement in the following manner:
(((VERB, X) (PRONOUN, SHORT, C, Y) Z) (NOUN, C, Y, W) Q)
where C is a variable for case labeling.

2.2. Terminal semantic representations

In the course of the search for an answer to the question: how are our observations about object-verb agreement related to the actually observable reality of language, we have seen so far that agreement is not formally manifested either in interpretable phonetic representations or in any abstract phonological representation but that it is represented in prelexical representations. Accordingly, agreement has thus far emerged as an abstract syntactic property of sentences. Before establishing this as fully characteristic of agreement phenomena, we have to consider that it is possible in principle that the representational schema of agreement that was provided at the end of the previous section characterizes not only prelexical representations of sentences but also other representations of them in the semantic mode, including terminal semantic representation. It is possible, in other words, that agreement is a derivationally persistent semantic property of sentences that is thus both abstract and observable. There is in fact at least one recent proposal in the literature, that of Keenan's (Keenan 1972, 446ff), that explicitly claims that verb agreement markers, including object-verb agreement markers, are present in interpretable semantic representations. We will therefore next turn to the consideration of the meaning of agreeing sentences to decide on this issue, by proposing a terminal semantic representation for such sentences and then examining it from the point of view of whether it is or it is not analysable into the representational schema of agreement given above. Before doing this, however, it is necessary to discuss general adequacy criteria for terminal semantic representations.

The terminal semantic representation of a sentence is adequate to the extent that its interpretation is an observationally correct statement about the meaning of the sentence. Since meanings, by definition, are unobservable unless expressed in some way, one can ascertain the meaning of a sentence only by reference to meanings of other expressions, linguistic or non-linguistic, that people judge to mean the same thing or to mean some different thing.[38] Since the most comprehensive and most preferred means of rational expression is linguistic expression itself, the adequacy of the semantic representation of a sentence is best measured in relation to the semantic representations of other sentences

---

[38] For some discussion about the significance of discriminative judgments in determining both semantic and phonetic representations, compare Sanders 1967, 11ff and Sanders 1972, 38ff.

of the same or of some other language. In particular, the semantic representation of the sentence will be adequate if it is the same as the semantic representation of all other sentences that people use to convey the same meanings by and if it is distinct from the semantic representations of all sentences that are used for the expression of different meanings.[39]

That the ability to know the difference between sentences that have the same meaning and sentences that mean different things is indeed a basic ability involved in language use is shown by the fact that, by token of recognizing sentences synonymy, people who know a language can use some sentences to verify the truth of some other sentences that have a different form. Thus, for instance, a person who wants to know whether the sentence This house has been broken into. is true or false will know that this sentence is true if he is told, by a truth-worthy person, that the sentence Somebody has broken into this house. is true. Similarly, by token of recognizing semantic irrelevance, he will also know that the truth or falsity of many other sentences, such as that of Goethe was a German poet., has no bearing on the truth or falsity of the sentence This house has been broken into.

The basic binary judgment about sameness and distinctness of sentential meanings does not exhaust the total range of semantic sentence relations that people know and utilize in the course of linguistic commuication. As countless everyday observations testify, sentences can be used as tools to find out about the truth of other sentences even if they are not exactly identical in meaning. For instance, if somebody accepts the truth of the sentence John's wife has had an appendectomy. he will also know that the sentence John's wife has been sick. is true, even though the two sentences do not have the same meaning. Similarly, a person will know that if the sentence John's wife has had an appendectomy. is true, then the sentence John's wife has not had an appendectomy. must be untrue; but that the sentence John has a wife. must be true if either of the two sentences John's wife has had an appendectomy. and John's wife has not had an appendectomy. is true.

In sum, to say that sentences bear semantic relations to each other is tantamount to recording the simple observation that all sentences of a language do not have to be separately compared with some state of affairs

---

[39] For a similar discussion of the significance of semantic sentence relations for evaluating semantic representations, compare Keenan 1969.

in the real world in order to find out about their truth or falsity but the direct verification of some sentences can be used to indirectly verify many others. Each of the distinctive intersentential meaning relations within the broad spectrum extending between total semantic identity and some very high degree of semantic distinctness, or total semantic irrelevance, provides an additional adequacy test for semantic representations in that such representations will be taken to be adequate only to the extent that they explicitly characterize all such semantic relations that a sentence may bear to other sentences.

An examination of sentences from the point of view of the contribution they can make to finding out about things in the world thus leads to defining distinctive intersentential relations based on the varying degrees and kinds of usefulness of sentences in this respect relative to each other. On the other hand, considering sentences from the point of view of what we have learned by verifying them, single sentences taken by themselves also fall into distinctive classes. The sentence characteristics that define these classes provide, in addition to the sentence relations described above, further tests for the adequacy of semantic representations in that such representations will be adequate only to the extent that these intuitively understood sentence characteristics can be read off them.

Single sentence characteristics that classify sentences from the point of view of how they contribute to finding out about the real world are basically two in kind. First, there are sentences which by themselves constitute an intuitive antipode of synonymous sentence pairs, in that whereas verifying the truth or falsity of a member of a synonymy set guarantees the respective truth or falsity of other members of the set, verifying the truth or falsity of sentences of this kind does not even guarantee the respective truth or falsity of the sentence itself. An example of this kind of sentence is The chicken is too hot to eat., since verifying that a given chicken feels to hot to want to eat something does not guarantee that some carnivorous animal attempting to eat the chicken would find it to be too hot to be eaten. Second, there are individual sentences that intuitively resemble a member of a synonymy set in that they do not have to be checked against some real state of affairs in order to find out about their truth or falsity. Whereas, however, a member of a synonymy set does not have to be compared with some real state of affairs because it can be indirectly verified by directly verifying a sentence that is synonymous with it, sentences of this kind do not have to be checked against reality simply because their truth or falsity does not vary with events of the real world. Such sentences are, for instance, The teacher is a teach-

er., which cannot be false under any condition, or the sentence The teacher is not a teacher. which cannot be true under any condition.

The various distinctive sentence relations and sentence properties that have been discussed above and that all constitute adequacy tests for interpretable semantic representations can be operationally defined, for minimal sentence sets, and further exemplified as follows:[40]

A. SEMANTIC IRRELEVANCE Two sentences are semantically irrelevant to each other if the truth or falsity of neither of them is systematically related to the truth or falsity of the other; e.g.

a. A leaf has fallen off the tree.
b. The battle of Mohacs took place in 1526.

B. CONTRADICTORINESS Two sentences are contradictory if the truth or falsity of either of them guarantees the respective falsity and truth of the other; e.g.

a. A leaf has fallen off the tree.
b. No leaf has fallen off the tree.

C. SYNONYMY Two sentences are synonymous if the truth or falsity of either of them guarantees the respective truth and falsity of the other; e.g.

a. The man hails from Germany.
b. The man is a German.

D. ENTAILMENT Of the two sentences S1 and S2, the meaning of S1 entails the meaning of S2 if the truth of S2 guarantees the truth of S1 (and, redundantly, the falsity of S1 guarantees the falsity of S2); but the falsity of S1 does not guarantee the falsity of S2 (and, redundantly, the truth of S2 does not guarantee the truth of S1); e.g.

a. He is reading a book. (entails)
b. He is reading something.

E. PRESUPPOSITION Of two sentences S1 and S2, the meaning of S2 is presupposed by the meaning of S1 if the truth of S2 is guaranteed both by the truth of S1 and also by the truth of an S3 such that S3 is true or false, respectively, when S1 is false or true; e.g.

a. I drank some wine. (both presuppose)
b. I didn't drink any wine.
c. Wine is liquid.

F. ANALITICITY A sentence is analytic if at least one of the ways in which its meaning can be exhaustively described is by the con-

---

[40] For synonymy, ambiguity, analyticity, self-contradiction, entailment, and presupposition, compare Sanders 1972c and 1972a, 33-63; for entailment and presupposition, compare also Keenan 1969, 1972.

junction of two sentences such that the truth of the first of them guarantess the truth of the second; e.g. This father is male. is analytic since its meaning can be described by This person is a father and he is male., and the truth of the sentence This person is a father. guarantees the truth of the sentence This person is male.

G. SELF-CONTRADICTION A sentence is self-contradictory if at least one of the ways in which its meaning can be exhaustively described is by the conjunction of two sentences such that the truth of either of them guarantees the falsity of the other; e.g. This father is not male. is self-contradictory, since its meaning can be exhaustively described by This person is a father and he is not male., and This person is a father. and He is not male. are contradictory.

H. AMBIGUITY A sentence S1 is ambiguous if its truth and falsity at least under some conditions guarantees the respective truth and falsity of sentence S2 and if its truth and falsity at least under some conditions guarantees the respective truth and falsity of sentence S3; but it is not the case that the respective truth or falsity of S2 guarantees the truth and falsity of S3 and it is not the case that the respective truth or falsity of S3 guarantees the truth and falsity of S2; e.g. They are walking dogs. is ambiguous, since some of the conditions under which it will be true or false will be the same as the conditions that make the sentence They are making dogs walk. true or false, respectively; and some of the conditions under which it will be true or false are the same that will make the sentence They are dogs who walk. true or false, respectively; but the two sentences They are making dogs walk. and They are dogs who walk. do not guarantee each other's truth and falsity.

Some thinking about these operational characterizations reveals that they characterize complex properties and relations which can be shown to be related to each other in that they all appear to be characterizable by two elementary sentence relations. In particular, it seems that synonymy, entailment, analyticity, and ambiguity can all be characterized in terms of a relationship called here implication; (mutual) contradictoriness can be characterized in terms of contradictoriness; and presupposition, self-contradiction, and semantic irrelevance can be defined by reference to implication and contradictoriness; where implication is a relationship between two sentences such that the truth of one of them guarantees the truth of the other; and contradictoriness is a relationship between two sentences such that the truth of one of them guarantees the falseness of the other.

The resulting simplified characterizations of the above-mentioned eight sentence properties and sentence relations are the following:

1.a. SYNONYMY: S1 and S2 are synonymous if they mutually imply each other.

1.b. ENTAILMENT: S1 entails S2 if S1 implies S2 but S2 does not imply S1.

1.c. ANALYTICITY: S1 is analytic if S1 and the conjunction of an S2 and S3 mutually imply each other and S2 implies S3.

1.d. AMBIGUITY: S1 is ambiguous if S1 and an S2 mutually imply each other under some conditions and S1 and an S3 also mutually imply each other under some conditions, but S2 and S3 do not mutually imply each other.

2. MUTUAL CONTRADICTORINESS: S1 and S2 are mutually contradictory if S1 is contradictory to S2 and S2 is contradictory to S1.

3.a. PRESUPPOSITION: S1 presupposes S2 if S1 implies S2 and an S3 implies S2 and S1 and S3 are contradictory.

3.b. SELF-CONTRADICTORINESS: S1 is self-contradictory if S1 and the conjunction of an S2 and S3 mutually imply each other and S2 and S3 are contradictory.[41]

3.c. SEMANTIC IRRELEVANCE: S1 and S2 are semantically irrelevant to each other if neither of them implies or contradicts the other.

If these considerations are at least basically correct and it is indeed the case that all distinctive semantic sentence relations and properites can be characterized in terms of implication and contradiction, then this means that a formalism by means of which implication and contradictoriness can be represented will also be sufficient for the characterization of all the other meaning characteristics and relations.

A simple and intuitively satisfying characterization of implication and contradictoriness is provided by assuming that members of sentence pairs that are in such relations to each other have some of their meanings in common with each other, to represent the fact that there is a meaning-predictability relationship between these sentences, but that one of them must include (in the case of contradictory sentences) or may include (in cases of implication) meaning elements that the other

---

[41] The proposed chacterizations of analyticity and self-contradiction actually cannot stand in this form. This is because these characterizations include the condition that analytic and self-contradictory sentences should be able to be implied by other sentences; and since implication involves one sentence guaranteeing the truth of another, it makes sense to talk of implication only for sentences that can under some conditions be true and under others, false, which is not the case for analytic and self-contradictory sentences.

does not, to correspond to the non-identity of their meanings. With respect to contradictory sentences, this non-shared element must be one with the power of reversing truth values. Although it would be equally possible to assume that of two contradictory sentences the affirmative one contains this additional meaning element, I will make the traditional assumption that it is the negative member which contains it. In the case of sentence pairs where one member implies the other, this non-shared meaning element should be assigned to the implying sentence and it should be one that has the power of rendering the truth value of that sentence unpredictable from the other, rather than reversely predictable as in the case of contradictory sentences. The fact that thus, representationally, the meaning of the implied sentence is fully within, or included in, the meaning of the implying one correponds to the true observation that the truth of the implied sentence is necessary but not sufficient for the truth of the implying one; and the other true observation that the truth of the implying sentence is sufficient but not necessary for the truth of the implied one is mirrored by the fact that the implying sentence may properly include, rather than fully include, the other; i.e. there may be an additional part to the meaning of the implying sentence that is not included in the meaning representation of the implied one.

It seems, therefore, that the two basic semantic relations of implication and contradictoriness can both be characterized as inclusion relations between semantic representations. The two relations are differentiated by the nature of the non-shared element: in the case of contradictoriness, the non-shared element is one whose interpretation is reversing the truth value of the sentence and in the case of implication, the non-shared element is such that it does not have this interpretation.

Intuitively understood inclusion relations between sentence representations were shown by Sanders (1967, 1972a, 1972b) to be directly formalizable by assuming that representations of sentences consist of sets of properties where the presence of a property is represented by the presence of a property label and the absence of a property is represented by the absence of the corresponding property label. He also showed that this notation is necessary and not only sufficient, to the extent that neither categorical nor binary or multivalued feature systems can effect such representations.[42]

---

[42] The only other proposal for formally representing one of the above-mentioned relations, entailment, that I am familiar with is Keenan's (1972, 418, 411). Since he appears to assume that property terms of semantic representations are roughly lexical-item-size categories, I cannot see how his proposal would be extenable to account for sub-lexical entailment relations.

The formal characterization of implication can thus be given as follows: S1 implies S2 if the terminal semantic representation of S1 is ((N, X) (PRED, Y, Z) U) and the terminal semantic representation of S2 is ((N, X) (PRED, Y, Z) U) or ((N, X) (PRED, Y) U).[43] The formal characterization of contradictoriness can be similarly given as follows: S1 is contradicted by S2 if the terminal semantic representation of S1 is (N, X) (PRED, Y, Z) U) and the terminal semantic representation of S2 is either ((N, X) (PRED, NEG, Y, Z) U) or ((N, X) (PRED, NEG, Y) U).

With these considerations in mind about empirical adequacy criteria and formal properties of interpretable semantic representations, let us now consider empirically adequate and explicit meaning representations of agreeing sentences.

Perhaps all sentences with object-verb agreement have synonymous counterparts in other languages that do not include an object marker. For instance, the HUNGARIAN sentence szeretem ő "love-him-I him" 'I love him.' which has an agreement marker in it is synonymous with the ENGLISH sentence 'I love him.' which contains a direct object but no object agreement. From this simple observation it follows that the presence or absence of an object agreement marker in semantic representations cannot vary with languages. It must either be present in semantic representations of a sentence in all languages or in none. The former assumption would imply that the object agreement marker is subsequently language-specifically deleted; and the latter would imply that it is language-specifically inserted. Although the crosslinguistic semantic uniformity of semantic representations with respect to the presence and absence of the object agreement marker thus follows, the cross-constituent uniformity of semantic representations does not follow in the same manner. In particular, it is possible that some semantic element set corresponding to a subject agreement marker is present in the terminal semantic representations of sentences, but that object agreement markers are not semantically terminal; or that definite object agreement markers are but preverbal indefinite object agreement markers are not.

The obvious heuristics that follows from these considerations is that in our attempt to establish the meaning of sentences with object-verb agreement we can take sentences from any language as long as they are

---

[43] I am following here Sanders' definition of entailment; compare Sanders 1972a, 51 and 1972c, 28.

synonymous with sentences that include agreement markers in another language. In particular, ENGLISH translation equivalents of SWAHILI sentences with object agreement will provide appropriate guides for constructing semantic representations for the SWAHILI sentences even though ENGLISH has no object-verb agreement. Second, we should consider sentences that include direct objects belonging to each of the subclasses of objects that we have seen to be agreement-significant. There are, as we have seen, four such kinds of direct objects: definite preverbal, definite postverbal, indefinite preverbal, and indefinite postverbal. The rest of this section will therefore be justifiably devoted to a consideration of the meaning of four ENGLISH sentences each of which includes a direct object that represents one of these four agreement-significant object classes. The results of these considerations will then be taken to be indicative of the semantic properties of translation equivalents of these sentences in any language, including those that exhibit various object-verb agreement patterns.

The four sentences will be these:

a. Mike ate the apple. (postverbal definite object)
b. Mike ate an apple. (postverbal indefinite object)
c. Mike ate the apple. (preverbal, or discourse-relevant, definite object)
d. Mike ate an apple. (preverbal, or discourse-relevant, indefinte object) [44]

---

[44] Since, although I do not have conclusive data for every language, most evidence, as mentioned in the first section of the paper, indicates that preverbal objects are discourse-relevant, I will assume that this is in fact the case for all languages. The theoretical issue that is involved is whether it is indeed true that the assignment of linear precedence relations is subsequent (in phonetically terminated derivations) to syntactic rules or not; i.e. whether it is indeed true that "all traditionally-recognized major grammatical relations are order-independent, including such relations as dominance, concord, scope, agreement, government, attribution, coordination, and subjecthood" (Sanders 1970b, 479-480). In particular, if it is true that the class of agreeing objects in some languages can be defined only by reference to linear position, then post-syntactic ordering cannot be maintained; if, however, it turns out that in all languages for the characterization of agreeing objects reference to linear position is sufficient but not necessary--i.e. the class can also be defined in non-linear terms--or it is neither sufficient nor necessary, then the generalization can be maintained.

Let us first take the sentence Mike ate the apple . and consider its implications. This sentence implies other sentences such as the following:

a. Somebody did something.
b. Something happened to something.
c. Somebody consumed something.
d. Somebody ate something.
e. Some solid food was consumed.
f. Somebody ate.
g. Mike did something.
h. Mike did something to something solid.
i. Something that is known was eaten.
j. Somebody is called Mike.
k. Somebody can eat.
l. An apple is something edible.
m. An apple is not liquid.
n. The time of an event is past.
o. An apple that is known was eaten.
p. The apple was eaten by Mike.

These sentences do not exhaust the list of sentences whose truth is predictable from the truth of the sentence Mike ate the apple. but they provide a sizable sample of them. The various implications listed differ on whether they are entailments (e.g. Somebody did something.) or synonyms (e.g. The apple was eaten by Mike.) or presuppositions (e.g. An apple is something edible.). An adequate meaning representation, in terms of the now understood sense of adequacy, would be provided by the conjunction of two appropriately differentiated sets of predications such that members of each set are mutually non-redundant and they are minimal predications in the sense that they do not have any further entailments, that members of one set are all entailed by the sentence, and members of the other are all presupposed by it, and such that members of each set jointly provide for all entailments and all presuppositions of the sentence. Presuppositions from entailments can be separated by considering a sentence contradictory to Mike ate the apple. which is Mike did not eat the apple. and examining which implications are entailed by both and which are entailed by the affirmative sentence only. Shared implications--i.e. presuppositions--are these:

P1. There is somebody and he is called Mike.

P2. There is something and it is known and it is a solid and it is natural and it is consumable and it is pomaceous.

P3. An event is talked about and it is consuming and it is by digestion and it is by the somebody called Mike and it is of the known solid

natural pomaceous consumable thing.

The implication of Mike ate the apple. that is not shared by its contradictory sentence is that the event was in fact brought about:

E1. That person did that thing.

Having now proposed sets of mutually non-redundant minimal entailments and presuppositions which are jointly exhaustive of the meaning of the sentence, the question is how members of the two sets should be differentiated. Since I don't know of any semantic argument in favor of one rather than another imaginable manner of differentiation, I will accept McCawley's (1971) and Keenan's (1972) proposal which I take it is based on evidence from syntax--namely on the fact that syntactic constituents that correspond to presupposed meaning are often or perhaps always syntactically subordinate--that entailments and presuppositions should be differentiated in terms of supraordinate versus subordinate semantic constituents.

The meaning representation of the sentence Mike ate the apple. that thus emerges can be paraphrased as Something that is animate and male and is called Mike did a thing which was consuming of a known solid natural pomaceous consumable thing. and it can be formalized as follows: (VERB, PAST, CONSUME (NOUN, AGENT, DEFINITE, ANIMATE, MALE, NAME, MIKE) (NOUN, DEFINITE, INANIMATE, CONCRETE, SOLID, NATURAL, POMACEOUS)).[45]

Turning now to the representations of the other three sentences, the relevant observation determining how their representations should differ from that of the sentence Mike ate the apple. is that sentences with definite objects entail sentences with indefinite objects; and sentences with discourse-relevant objects entail sentences with objects that are not discourse-relevant. Compare the following:

Mike ate the apple. entails
Mike didn't eat the apple. does not entail ⇏ Mike ate an apple.

Mike ate the apple. entails
Mike didn't eat the apple. does not entail ⇏ Mike ate the apple.

What follows from this and from the assumption that the semantic representations of entailing sentences should properly include the semantic representations of entailed sentences is that the semantic representation of Mike ate an apple. should differ from that of Mike ate the apple. by the non-inclusion by the former of the semantic element DEFINITE

---

[45] There is an interesting alternative proposal according to which all transitive verbs consist of the coordination (Sanders 1967) or subordination (Ross 1972, Anderson 1968, Lee 1969, Eckman 1974) of two (one-place) predicates; which, however, I have not investigated in detail.

included in the latter; and that the semantic representation of Mike ate the apple. should differ from that of Mike ate the apple. (and the semantic representation of Mike ate an apple. should differ from the semantic representation of Mike ate an apple.) by the inclusion by the former of the semantic element RELEVANT not included in the latter. The semantic representation of Mike ate an apple. is therefore (VERB, PAST (AGENT, DEFINITE, ANIMATE, MALE, NAME, MIKE) (NOUN, INANIMATE, CONCRETE, SOLID, NOUN, NATURAL, POMACEOUS)); and the semantic representation of Mike ate the apple. is (VERB, PAST (NOUN, AGENT, DEFINITE, ANIMATE, MALE, NAME, MIKE) (NOUN, DEFINITE, RELEVANT, INANIMATE, CONCRETE, SOLID, NATURAL, POMACEOUS)).

This actually concludes our attempts to design terminal semantic representations for sentences that involve members of agreement-significant object classes. In closing, however, I would like to evaluate these representations from the point of view of how they provide for the differentiation of verbal and nominal constituents; and how they provide for the differentiation of different nominal constituents of the sentence.

Let us first consider how the proposed representations differentiate between verbs and nouns. As given above, the representation does not represent nominal constituents as being independent ones in that they are included in the verb. There seem to be two sub-claims to justify in this respect: first, that verbs and nouns constitute one, rather than two, semantic constituents; and second, that they jointly constitute a verbal (rather than, for instance, nominal) constituent. The first claim is motivated by the observation that the set of verbal and nominal semantic properties intersect and the second is justified by the observation that whereas not all objects include properties that are not verbal properties as well, all verbs include properties that are not nominal.

The overlap between nominal and verbal property sets can be illustrated in various ways. First of all, there are synonymous sentences that differ in the apparent inclusion of some semantic property in the verb or in the direct object; e.g.

a. He ate something.
b. He consumed some food.,

where the semantic property set SOLID, CONSUMABLE appears to be included in the verb of a. and not in its object; and in the object of b. and not in its verb. Second, there are synonymy sets whose members differ by the respective inclusion of some semantic element by only one of the two constituents: verb and object, or by both; e.g.

a.1. He ate something.
a.2. He consumed some food.
b. He ate some food.,

where the property set SOLID, CONSUMABLE is included in the verb only of a.1., in the object only of a.2., and in both the verb and the object of b. Thirdly, there are synonymy sets whose members differ from each other by the respective inclusion and non-inclusion of all properties of the object in the verb; e.g.

a. He ate something.
b. He ate.; or
aa. He ate dinner.
bb. He dined.; or
aaa. (ENGLISH) He combed his hair.
bbb. (HUNGARIAN) Ő fésülködött. "he comb-derivational suffix-past" 'He combed his hair.' Fourthly, there are contradictory sentence sets where the contradiction can be best represented as the result of the inclusion of a semantic property in the verb of one sentence and the inclusion of a contradictory semantic property in the object of the other sentence; e.g.

a. He consumed food.
b. He drank.,

where a.'s object includes the property SOLID and b.'s verb includes the property LIQUID. Likewise, fifthly, there are self-contradictory sentences where the contradiction can best be represented as the result of two contradictory semantic properties being included, respectively, in the verb and in the object; e.g. He ate some water. or He poured out the table., where, in the first sentence, the verb includes the semantic property SOLID and the object includes the semantic property LIQUID; and, in the second example, the verb includes the semantic property LIQUID and the object includes the semantic property SOLID.[46] It is because two semantic properties can be contradictory only if one can be represented as the negation of the other and thus they have to be of the same type, that the last two points, about contradictory and self-contradictory sentences, contribute to illustrating the commonness between verbal and object properties.

It is also true, however, that verbs and direct objects do not share all of their semantic properties. In particular, it seems that verbs always include and objects may include properties that are not properties of the other constituent. The fact that all properties of the verb cannot be included in the object can be illustrated by the fact that synonymy sets such as He ate something., He consumed some food. and He did some eating., where the direct object progressively includes more and more properties of the verb

---

[46] For the suggestion that violations of selectional restrictions should be represented as instances of semantic contradiction, compare Sanders 1967, 1972a, 143-150.

do not have a further member where even the do of the last sentence could be included in the object. A property such as do, or "eventness" is, however, always included in all verbs. Conversely, there are also some nominal properties that cannot be included in the properties of lexical verbs and these are quantificational and referential properties. In particular, whereas there is a verb such as epistolize meaning 'write letters', there is no verb to mean 'write two letters' or a verb to mean 'write the letter (mentioned before)'. In other words, lexically only generic or indefinite but not definite objects can be included in the verb. Thus, the fact that objects in some cases--if they are generic or indefinite and non-emphatic can be totally included in their verbs, but verbs can never be totally included in their object, motivates the assumption that verb and objects should be represented semantically as one verbal constituent.

All these considerations about the total semantic includability of objects in verbs and the partial semantic includability of verbs into objects also hold with respect to the verb and its other nominal complements such as the indirect object and adverbials. Compare the synonymy sets He likes to talk. and He likes to talk to people.; or He kicked the hassock. and He kicked the hassock with his foot. Subjects, however, seem to be different in this respect. Intransitive subjects, to be sure, are very similar to direct objects and to other verb complements in that many specific properties of theirs are presupposed by their verbs such as solidity-liquidity in The water flowed down the street. (compare *The typewriter flowed down the street. and I poured the water down the street., *I poured the typewriter down the street.), visibility-audibility in A high C sounded. (compare *A high C became visible. and I heard a high C., *I saw a high C.), concreteness-abstractness in The stone fell. (compare with *Beauty fell. and I dropped the stone., *I dropped beauty.), oneness-manyness in John and Mary parted. (compare with *John parted. and I separated John and Mary., *I separated John.). Transitive subjects, however, have as their only relevant property that they should be able to be the agent of an action i.e. that they should be animate, or human.

This brings us to the general question of how various nominal sentence constituents are differentiated from each other in the proposed semantic representations. In general, nominal constituents cooccurring in the same superficial simple sentence may or may not differ from each other in their descriptive and referential properties whereas they must differ in their case properties and perhaps also in their pragmatic properties. This is illustrated by the fact that there are sentences with two descriptively identical nominal constituents, such as This boy likes another boy. and there are sentences with two nominal constituents that are

referentially the same such as This boy likes himself. but there are no simple sentences where two nominals are case-functionally identical--such as a sentence with two agents--or sentences where two nominals are pragmatically identical (such as a sentence with two discourse-relevant, or topical, nominals).

Among the various nominal sentence constituents, the major division, from the point of view of case-functional and pragmatic uniformity, appears to be between subjects and all other verb complements. In general, the subject is always the nominal with the highest case function on the scale agent-dative-instrumental--unless the sentence is passive--and it is the discourse-relevant, or topical, nominal--unless some other constituent has been passivized, topicalized or dislocated.[47]

Non-subject constituents generally occur only if the sentence has a subject. If a sentence has two major nominal constituents, one is generally subject and the other may be a direct object or an indirect object, or an adverbial. The distinction between direct objects and other verb complements is much less clear than that between subjects and verb complements. In general, the intuitively understood concept of direct object may be best definable in a way similar to the way the concept "definite nominal" was defined in footnote 1--namely, by specifying it as a class of nominal constituents all members of which share some formal property, at least some members of them have some set of semantic properties and no members of which have another set of semantic properties.[48] The form-related variable referred to in this definition generally seems to be either some segmental or some sequential (but perhaps never solely some supersegmental) property; or a combination of these. The segmental property seems to be either the presence of some specific phonological segment sequence formally associated with the object (generally called case marker) or the presence of some specific phonological segment sequence formally associated with the verb (generally called agreement marker); or both.[49] In addition to the form-

---

[47] For the case-functional differentiation of major nominal constituents, compare Fillmore 1966. For the pragmatic differentiation of major nominal constituents, compare Shopen 1972.

[48] For some discussion on the crosslinguistic identifiability of grammatical constituent types in transitive sentences, see Greenberg 1963, 74; in bitransitive sentences, see Blansitt 1973, 2ff; and in general, see Ferguson 1970.

[49] For an observation of the cooccurrence of sequential and case marking, compare Greenberg 1963, universal 41.

related variable, the definition mentions two semantic sets. Of these, the positively diagnostic meaning constants included in the definition of direct objects may be PASSIVE and TOTAL; and the negatively diagnostic semantic constant set may include AGENT. This corresponds to the observation that direct objects differ from subjects in that they are never semantic agents and that they differ from other verb complement nominals in that they are most often patients and they most often express the total involvement of the nominal in the action. That direct objects are generally patients is indicated by the list of verbs that most often occur in grammars of various languages as verbs of sentences with direct objects. These are 'see', 'hit', 'kick', 'push', 'pull', 'move', 'bring', 'eat', 'take', 'write', 'wash', 'kill', 'cut', 'cook', 'kiss', 'put', 'break', 'clean', 'leave', 'finish', 'steal', 'give', most of which involve a physical action effecting something. Perhaps all of these, however, could also take some adverbial complement if the referent of the complement nominal is not totally involved in the action; compare He ate the meat. versus He ate of the meat.; He cut the bread. versus He cut into the bread.; or He kicked the man. versus He kicked towards the man. In addition to ENGLISH (compare Anderson 1970), HUNGARIAN, FINNISH, RUSSIAN and WALBIRI (Hale 1973) provide examples for the total versus partial involvement of the referent of a nominal being expressed by the case of the direct object as opposed to other cases.[50]

The proposed characterization of the concept "direct object" is such that it is possible for languages to turn out not to have direct objects. In particular, in order for a language not to have a direct object, one of the following has to be the case:

a. the positively diagnostic meaning properties are not properties of any nominal in the language--i.e. no constituent is both a nominal and passive and totally involved in the action

b. there is no form property that characterizes the expression of some members of the positively diagnostic semantic class that would not be shared by at least some members of the negatively diagnostic meaning class--i.e. there is no case marker, for instance, that marks (some) passive and totally involved nominals but no agents.

In conclusion: we have proposed meaning representations for sentences including agreement-significant classes of direct objects. These interpretable semantic representations have been evaluated in terms of the extent they correctly represent observable semantic relations among sentences. The semantic representations consist of semantic constituents

---

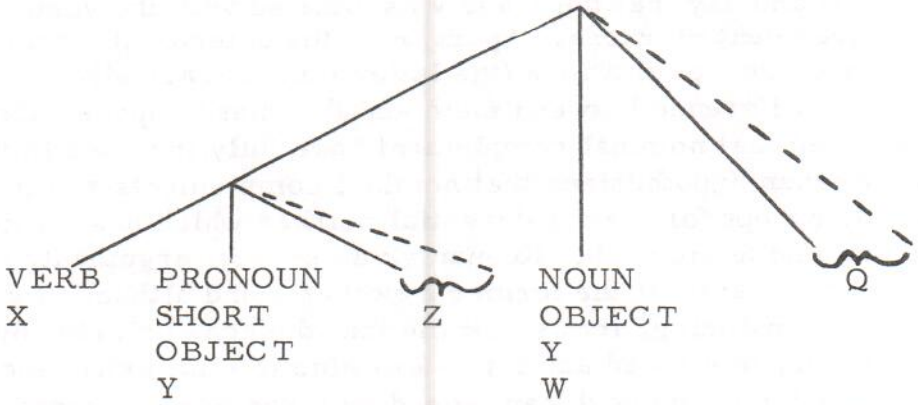
[50] I am grateful to Sandra Thompson for discussing these questions with me.

each of which consists of a set of descriptive, referential, case-functional, and pragmatic/semantic property labels and some of which may be in coordinate, others in subordinate relationship with each other. All semantic constituents are either nominal or verbal but at least some superficial nominal constituents are included in semantic verbal constituents. Agreement-significant constituent subclasses have been defined by the respective presence and absence of the semantic and pragmatic property labels DEFINITE and RELEVANT. Both the constituent class "definite" and the constituent class "direct object" have been seen not to be fully characterizable as a semantic class but, rather, as a form-class for the characterization of whose members some semantic criteria are necessary but not sufficient.

If we now compare our proposed terminal semantic representations with the representational schema of agreement, it becomes obvious that the former cannot be analysed as an instance of the latter. The schema of terminal semantic representation of simple transitive sentences is the following:

VERB
A
B
(NOUN
AGENT
C
D)
(NOUN
E
F)

The branching diagram representing the agreement schema is this:



The comparison clearly shows that the two representations differ both structurally and also in the kinds of property labels they involve. In

particular, whereas in terminal semantic representations there is no redundancy--that is to say, all property labels occur only once--in the prelexical representation there are two object constituents such that the property set of one properly includes the property set of the other, except for the property labels PRONOUN and SHORT. Similarly, whereas in the terminal semantic representation property labels such as OBJECT, PRONOUN, and SHORT do not appear, in prelexical representation they do. Finally, whereas in the terminal semantic representation the properties of the (later) object constituent are included in the verb, in prelexical representation both copies of the object are outside the verb such that the shorter one is sister to the verb. These observations suffice to establish that object-verb agreement relations are not represented in terminal semantic representations and that therefore the status of these relations is that of an abstract construct of grammar.[51]

---

[51] This view is identical with the generally accepted view according to which agreement is a phenomenon of "surface syntax". It is, however, in conflict with Keenan's view, who, as mentioned above, suggests that there are semantically motivated elements in terminal semantic representations that directly correspond to agreement markers. In brief, Keenan (1972) proposes that terminal semantic representations of sentences always include identical referential markers associated with the verb and its nominal complements and that these referential markers included in the verb correspond to verb-agreement markers. For instance, he would give as the terminal semantic representation of the sentence John hurt Mary. the following: (John, x) (Mary, y) (x hurt y) (page 451) and say that the x and y associated with the verb correspond to verb-agreement markers. Apart from the categorial and ordered nature of such representations (the latter I am not actually certain about), the relevant difference between them and the ones proposed above is that I hypothesized that nominal complements are fully included in their verb, whereas Keenan hypothesizes that nominal complements are fully outside their verb, except for their referential marker which has a copy both outside and inside the verb. Keenan gives several arguments in favor of the latter and against the former hypothesis and although I cannot find any of them convincing, let us assume that the non-inclusion hypothesis is semantically motivated and let us examine to what extent the referential marker included in the verb can indeed be taken to correspond to an agreement marker. Taking into consideration the labelling Keenan provides, the schema for the terminal semantic representation of a sentence,

(Footnote 51 continued)
according to his theory, would be this: (((PRED, X) (PROFORM, x) Y) ((NOUN, Z) (PROFORM, x)) Q) (where X, Y, Z, Q, W are variables for one or more categories, x is a variable for referential marker and where the given linear constituent order is (probably) significant). This is now to be compared with our representational schema of agreement: (for ease of comparison, I will write PRED for VERB and PROFORM for PRONOUN) (((PRED, X) (PROFORM, SHORT, C, Y) Z) (NOUN, C, Y, W) Q) (where X, Y, Z, W, Q are variables for property sets, C is a constant for a non-semantic case label and the given order is not significant). What is relevant for establishing whether the former can be said to include reference to an agreement marker is deciding

a. whether there is any element in the former which positionally corresponds to what the latter characterizes as an agreement marker

b. whether that element has the same content (i.e. property or category representation) as the content of the agreement marker as specified by the latter schema

c. whether the claimed distribution (cross-sententially and cross-linguistically) of the two corresponding elements is the same or different.

The answer to the first question is affirmative (in respect to grouping relations only, of course, and not to linear order): the proform that Keenan claims is semantically motivated is sister to a verbal constituent which, according to our agreement characterization, the agreement marker is, too. The answer to the second question is less clearly affirmative. In general, it appears that the semantic chacterization of the element that is sister to the verb: (PROFORM, x) is properly included in the characterization of an agreement marker: (PROFORM, SHORT, C, Y). In particular, the semantic element is not differentiated from other pronominal forms not included in the verb (which differentiation is effected by our property SHORT) and it only shares one property with the outer nominal, the property of having the same referent, rather than sharing with it its non-semantic case property and also some of its specific properties such as PLURAL, or NEUTER, some of which may be semantic, others syntactic. Thirdly, the distribution of the semantic schema across various types of sentences within the same language and across sentences of different languages is very different from the distribution of the agreement representation. In particular, the former is said to characterize all sentences (with verbal predicates) of all languages, whereas the latter is said to characterize only some sentences of only some languages. All in all, we may conclude that there is some similarity between the hypothesized semantic constituent (PROFORM, x) and the agreement marker (PROFORM, SHORT, C, Y) in that they are both co-constituents to the

2.3. Syntactic rules

We have considered three distinct representations of sentences with object-verb agreement: terminal phonetic representations (the formal nature of which, however, has not been explored here), terminal semantic representations, and a second, abstract, level of semantic representations called here prelexical. We have adopted explicit adequacy criteria for each of these three kinds of sentence representation. Terminal phonetic representations, consisting of the linear sequence of constituents that include interpretable phonetic labels, would be evaluated in terms of how well they correspond to phonetic observations. Terminal semantic representations consist of cognitive groupings of interpretable semantic property labels, with some groups being coordinately grouped with each other and others subordinately. The property and relation terms included in such representations are meant to be necessary and sufficient to represent all observable semantic relations that the sentence bears to others; and the representations are adequate to the extent that they in fact correctly and exhaustively represent these relations. Prelexical representations also consist of coordinate and subordinate groupings of semantic property labels but some of these labels are not interpretable; and the representation as a whole does not correspond to any directly observable facts of language in that the property and relation labels that characterize these representations are meant to be necessary and sufficient to differentiate distinct semantic lexical constituents and distinct semantically describable ordering relations from each other. What these representations show is which of the semantic properties and relations and of the phonetic properties and relations associated with the sentence can be shown to be directly equivalent. Whereas co-constituency in terminal semantic representations is interpreted as "belonging to the same concept" or "jointly conceived of", co-constituency in prelexical semantic representations defines the abstract notion "constituting the same lexical item", or "jointly symbolized by a set of phonetic properties and their linear relations". Whereas coordinate constituents in terminal semantic representations are interpreted as "jointly asserted"

(Footnote 51 continued)
verb, that the property representation of the agreement marker properly includes the property representation of the semantic constituent, and that the cross-sentential and crosslinguistic distribution of the semantic element properly includes the cross-sentential and crosslinguistic distribution of the agreement marker.

and subordinate constituents represent presupposed meaning, coordinate relationship in prelexical representations defines the abstract concept "orderable constituents" and the supraordinate-subordinate relationship contributes to characterizing "non-orderable constituents".

These sentence representations have been considered in search for an answer to the question about the nature of agreement relations. Upon examining these representations, we noted that agreement relations as we intuitively and traditionally understand them are not expressed in either of the two terminal representations and that they are not expressed in any non-terminal phonological representation, either; but that there is a characterization of such relations that can be formulated on the abstract level of prelexical representations which appropriately reflects the corresponding traditional concept. Agreement relations have thus been formally characterized as theoretical constructs such that the properties and relations involved in them are part of those that are sufficient to semantically characterize distinct lexical constituents and distinct ordering relations in the language.

This much, however, does not yet justify the positing of agreement representations. In order to establish the existence of an abstract construct, it has to be shown that the assumption of its existence facilitates a more general explanation of observations designated as significant by the theory than the contrary assumption would. In the special case of agreement representations, this means that such representations would be fully justified if it could then be shown that positing such representations allows for more general explanations of sentential sound-meaning equivalences than not positing them. Whereas the establishment of the necessity of agreement representations in this sense, which would thus involve a consideration of at least a few alternative grammars not making reference to agreement representations, appears to be beyond the material limits (although not the logical scope) of this paper, it will be attempted to show at least the sufficiency of the agreement hypothesis in proving sentencehood and other related linguistically significant theorems. Part of this task has in fact already been accomplished in that in section 2.1. it was shown that the assumption of agreement representations facilitates providing for a very significant part of such proofs: that part which includes derivationally adjacent heteromodal representations. In other words, it was shown that the assumption of agreement representations facilitates formulating lexical rules of some generality. What remains to be seen is whether such representations are also sufficient for the applicability of another set of rules, those that can be used to mediate between prelexical and terminal semantic representations. In other words, what remains to be done is providing the syntactic rules which, in conjunction

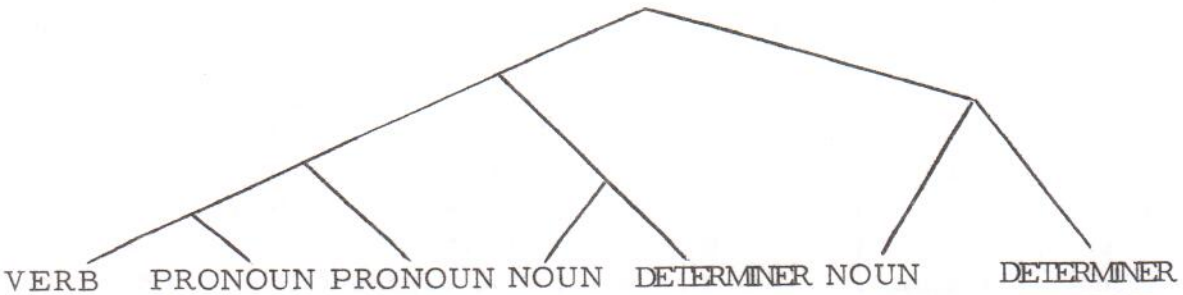
with the lexical and phonological rules, are sufficient to prove sentence-hood theorems of sentences with object-verb agreement.

Let us therefore examine again the terminal semantic and prelexical representations of a sentence with object-verb agreement and assess the exact manner and degree in which they differ from each other. The example will be a MODERN GREEK sentence o Petros to milon to efaye "the Peter the apple it ate" 'Peter ate the apple'.[52]

The terminal semantic representation of this sentence is this:

VERB
PAST
CONSUME
(NOUN
AGENT
DEFINITE
ANIMATE
MASCULINE
NAME
PETER)
(NOUN
DEFINITE
INANIMATE
CONCRETE
SOLID
NATURAL
POMACEOUS)

The prelexical representation is this:


VERB PAST CONSUME (AGENT ANIMATE) (SOLID)
PRONOUN SHORT SUBJECT
PRONOUN SHORT OBJECT NEUTER
NOUN OBJECT NEUTER SOLID NATURAL POMACEOUS
DETERMINER OBJECT DEFINITE NEUTER
NOUN SUBJECT DEFINITE NAME PETER
DETERMINER SUBJECT DEFINITE MASCULINE NAME PETER

[52] This sentence is my own unconfirmed compilation.

When we now begin to register the differences between the two structures, it is important to point out that implicit in the nature of the notation that we have used to represent terminal semantic and prelexical semantic structures there was an empirical hypothesis made about the distinctness relationship of these two kinds of representation. In particular, it is neither a logically nor an empirically necessary fact that the property labels that make up terminal semantic and prelexical semantic constituents and their groupings should be of the same kind. By assuming that in fact they are we have hypothesized that at least some terminal semantic constituent classes and some lexical and ordering classes are coextensive. In other words, we have hypothesized that if the property and relation labels of the two representations were notationally different, i.e. they would belong to two different modes, the conversion rules mediating between them would include many one-to-one bimodal equations, with one property label on each side, or one relation term on each side, which would thus indicate the non-necessity of assuming a prelexical mode distinct from the terminal semantic mode.

The two representations share some but not all of their terms, with neither of the two properly including the other. The differences are both differences in property labels and in their groupings. In general, the prelexical representation includes more property labels and more branches. The increase in property labels is, to a smaller part, the result of the addition of the new labels and, to a larger part, of the duplication of labels. The added property labels are part of speech terms such as PRONOUN and DETERMINER, major sentence constituent labels such as SUBJECT and OBJECT, and others such as NEUTER, and SHORT. The duplicated labels are all properties of nouns included in verbal or pronominal constituents, such properties of the object included in the verb (SOLID), properties of the subject included in the short subject pronoun (SUBJECT), properties of the object included in the short object pronoun (OBJECT), and properties of the subject and object nouns included in their determiners (DEFINITE). The only property labels present in terminal semantic and absent in prelexical representation are the case-functional label of the subject, AGENT, and the property NOUN of the two nominal constituents included in the verb. The structural changes consist of the replacement of the terminal semantic one-constituent structure by the prelexical seven-constituent structure, the highest constituent of which is the two sister constituents constituting the subject, the next highest is the two sister-constituents constituting the object, then the short object pronoun, and then an internally coordinate constituent consisting of the short subject pronoun, and the verb.

The heuristically simplest syntactic rule that would be sufficient to account for the symbolic equivalence of the given terminal and given prelexical representations is an equational statement whose one side consists of the given terminal semantic representation and whose other side consists of the given prelexical representation. Such a one-step syntax might even have some crosslinguistic validity in that it is possible that the same "rule" could also be used in proving sentencehood theorems about sentences that mean 'Peter ate the apple.' in languages other than MODERN GREEK. The statement, however, would have no cross-sentential validity in that it could not be used in derivations of sentences that mean something other than this. We will therefore attempt to find an alternative account which is both cross-sententially and crosslinguistically useful and for which not only sufficiency but necessity, too, can be claimed. I will first present a proposal for a set of such rules and then will discuss their motivation. In giving this account, I will not discuss rules to account for the differences in the two representations that are completely unrelated to verb agreement (such as the respective presence and absence of the determiner constituent) but only rules that account for the agreement-related differences concerning the distribution of nominal properties in relation to the verb.[53] In other words, I would like to account for the symbolic equivalence of all pairs of representations that can be analysed as follows:

1. (VERB, X (NOUN, AGENT, Y) (NOUN, Z))
2. (((VERB, X) (PRONOUN, SHORT, SUBJECT, U) (PRONOUN, SHORT, OBJECT, V)) (OBJECT, V, W) (SUBJECT, U, Q)).

The rules are the following:

A. AGENT = AGENT, SUBJECT
B. SUBJECT = SUBJECT, AGENT
C. ((NOUN, SUBJECT, X), (NOUN, -SUBJECT, Y) Z) = (NOUN, SUBJECT, X) (NOUN, -SUBJECT, OBJECT, Y)[54]
D. (((VERB, X) (PRONOUN, Y) Z) (NOUN, W) (NOUN, Q) = ((VERB, X) (PRONOUN, SHORT, Y) Z) (NOUN, W) (NOUN, Q)
E. (VERB, X, Y (NOUN, Z)) = ((VERB, X, Y, (NOUN, Z)) (NOUN, Z))
F. ((X, Y) (PRONOUN, X) Z) = ((X, Y) (X, Y) Z)

---

[53] For a complete set of syntactic rules that are necessary to prove sentencehood theorems of at least some sentences with object-verb agreement, see section 2.5.

[54] -X is a variable for all representations that do not immediately include X. Cf. Sanders 1970b, 496.

The first four rules, A through D., are constant-addition-deletion, or redundancy, rules, with the redundant element being SUBJECT in A., AGENT in B., OBJECT in C., and SHORT in D. These rules can be used to effect the phonetically directed deletion of the semantic element AGENT and the phonetically directed addition of the intermediate elements SUBJECT, OBJECT, and SHORT and thus to account for the fact that AGENT is present in the terminal semantic, but not in the prelexical, representation and that SUBJECT, OBJECT, and SHORT are present in prelexical, but not in terminal semantic, representations. Of the four rules the latter two are more complex than the former two. In particular, C. says that any nominal constituent of the sentence that is not a subject is an object (which, of course, is true for simple transitive sentences only in this form, although it could be extended so as to say that the nominal constituent of the sentence that is not marked for any case function is the object). Rule D. adds SHORT to those pronominal constituents that are associated with the verb such that there are two other higher nominal (or pronominal) constituents in the sentence.

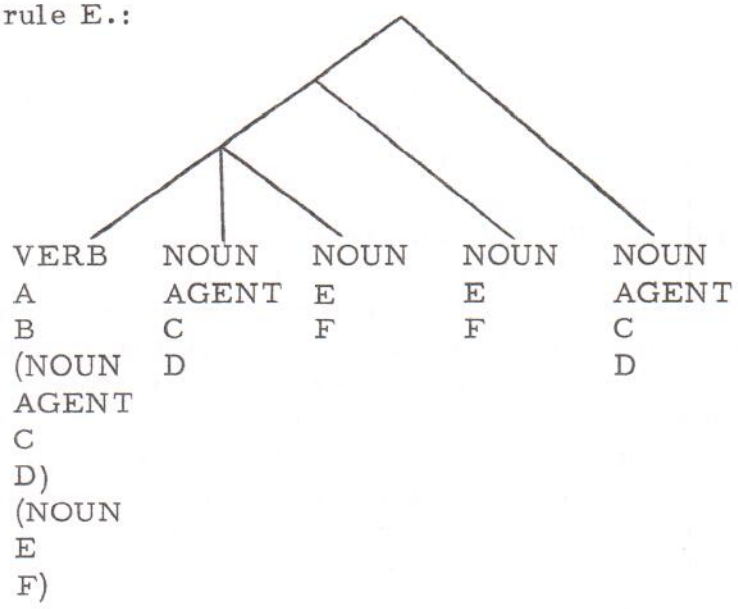
Both rules E. and F. involve the copying (or, in reverse, deleting by identity) of some properties. Rule E. is more restricted in that it mentions nouns associated with verbs and specifies complete copying-deletion of the nominal constituent. Rule F. refers to constituents of any kind and it specifies partial copying-deletion; in addition, it also specifies the addition of the constant PRONOUN to the constituent whose properties have been deleted (or, in reverse, the deletion of the element PRONOUN from constituents into which identical properties are copied). Rule E. can therefore be used to account for the fact that nominal properties that occur only once in terminal semantic representations occur more than once, and grouped into separate constituents, in prelexical representations; and rule F. can be used to account for the fact that not all properties of terminal semantic nominal constituents appear duplicated in prelexical representations.

The sequence of intermediate sentence representations between terminal semantic and prelexical representations whose symbolic equivalence with the latter can be shown by the given rules is the following (given in the order as they would occur in a phonetically-directed derivation):

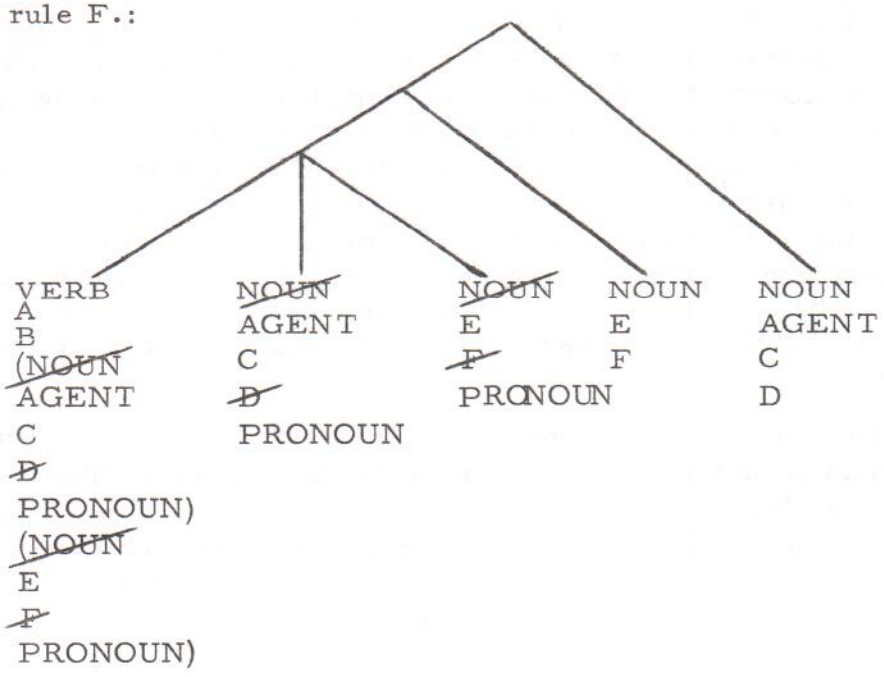
Terminal semantic representation:

VERB
A
B
(NOUN
AGENT
C
D)
(NOUN
E
F)

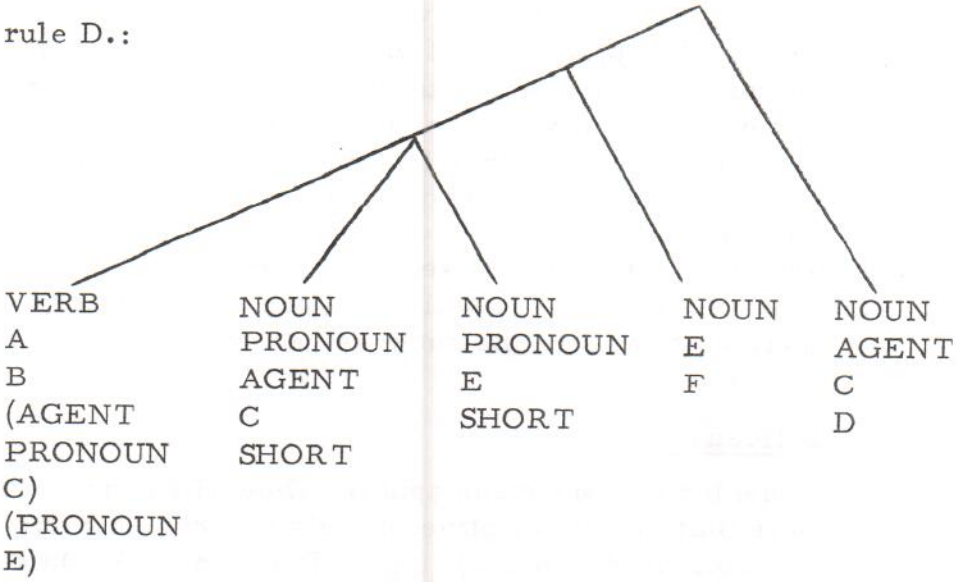
Output of rule E.:



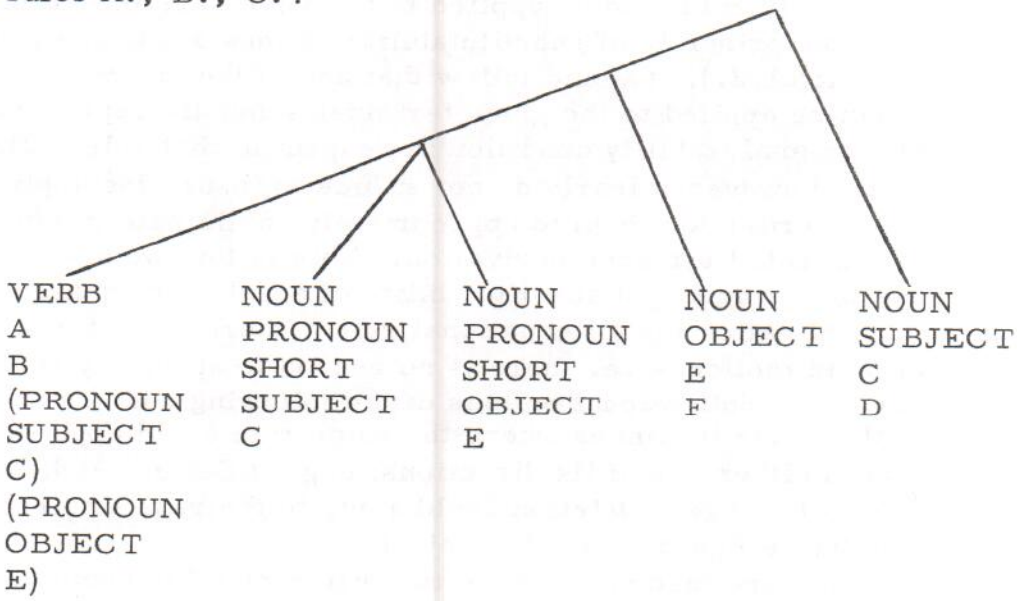
Output of rule F.:



Output of rule D.:



Output of rules A., B., C.:



This final output of the proposed rules is a tree schema which the prelexical representation of the MODERN GREEK sentence o Petros to milon to efaye fits, except for the fact that in the present tree the two agreement markers are sisters to each other, whereas in the MODERN GREEK sentence the object agreement marker is supraordinate to the subject agreement marker. The reason why these rules cannot account

for this fact will be discussed next when we turn to the principles that govern the successful application of these rules. It is clear namely that the given rules can be applied to the given terminal semantic representation in many different ways that vary according to whether all rules are applied or only some, whether the rules are applied in one direction or in the other, and whether, of two rules, one applies before the other does or reversely; and that the set of rule-applicational alternatives that the above-given derivation was based on constitute only a small subset of the logical possibilities. We will therefore next consider what would be some principles to assure the successive use of these rules and to exclude other uses.

2.4. Rule Application

Let us consider our six rules again. They will henceforth be referred to by labels that are descriptive of their desired phonetically directed effects; i.e. Subject Addition (A.), Agent Deletion (B.), Object Addition (C.), Short Addition (D.), Raising (E.), and Pronominalization (F.). Let us assume that there is a terminal semantic representation given, of the kind schematizable as (VERB, A, B (NOUN, AGENT, C, D) (NOUN, E, F), with the six rules to be applied to it. Given the analyzability condition and the principle of substitutability of equals (as described at the end of section 1.2.), it would follow that any of the six rules given may or may not be applied to the given terminal semantic representation if it meets the analyzability condition in respect to that rule. These two principles, however, clearly do not suffice to insure the application of the rules in order for them to appropriately participate in effecting a phonetically directed sentence derivation. This is for two basic reasons:

1. Since the principle of substitutability of equals for equals determines optional application for all equational rules, there is no force to set the derivation in motion--i.e. there is no reason to apply any rule

2. There are applicational options of the following sorts:

a. there are instances where the same rule could apply to a representation in either one of its directions; e.g. if Subject Addition applies, then afterwards Agent Deletion could apply to the resulting representation either to delete Agent or to add Subject.

b. there are instances where two different rules could equally apply to the same representation; e.g. to the given terminal semantic representation, Agent Deletion and Raising could equally apply

c. there are instances where a rule could apply to representation in two different ways (or, in other words, two more particular rules derivable from the same general rule given could equally apply); e.g. Raising could apply to the given terminal semantic representation to raise the agent constituent, or to raise the non-agent constituent; or to raise both.

As discussed in section 1.2., the most general principle to explain the use of grammatical rules is the hypothesis that language use is goal-directed behavior. Sanders (1973) explains that the competence that is involved in knowing a language can be conceptualized as consisting of two distinct types of knowledge: that of knowing rules and that of knowing how to apply them. The latter type he says is best considered as a manifestation of general goal-directed behavior, where the goal is taken to be providing phonetic expression for thoughts, in the case of speaking, and reconstructing thought from a phonetic string, in the case of understanding.

The type of rules that this assumption most clearly governs the use of is bimodal substitution rules, since these are the only rules of the grammar that can make direct contribution of both semantic and phonetic terminality. In particular, what follows from this concept with respect to the application of these rules is that they must apply whenever they can apply and directed so as to make maximal contribution towards the maximalization of terminality in the given proof. The concept of goal-directed rule application, however, would seem to determine the application of monomodal--i.e. syntactic and phonological--rules with lesser completeness. Taking syntactic rules, for instance, they, because of their very nature, cannot possibly make any direct contribution towards the maximalization of phonetic terminality, although some of them--in particular, constant-addition-deletion rules--can make a contribution to semantic terminality. This would then mean that syntactic rules can be considered goal-directedly applied only to the extent that they are constant-addition-deletion rules adding terminal semantic elements and only in semantically directed but not in phonetically directed proofs. As Sanders points out, however (Sanders 1972a, 107ff, 112ff), there is actually an equally reasonable intermediate goal that can be assumed for syntactic rules in phonetically directed derivations, and not only for terminal semantic constant-addition-deletion rules, namely that they should make maximal contribution to transforming terminal semantic representations into <u>potentially</u> phonetic--i.e. lexicalizable and orderable--structures.

Given these considerations, and given our six rules, the obligatoriness and directed use of the five rules involving constant-addition-deletion rules appear to be determined both in semantically directed and in phonetically directed proofs. Four of these rules add-delete intermediate elements such as SUBJECT, OBJECT, PRONOUN, and SHORT. Since these elements are indispensable for the phonetically-directed application of some of the lexical rules of the grammar, the phonetically-directed additive application of these rules can be seen to be assured. Reversely, since these elements, being semantically uninterpretable, do not contribute to semantic terminality, the semantically directed deletive application of these rules again seems to be goal-governed. The fourth constant-addition-deletion rule involves the deletion of a semantically interpretable element, AGENT. The semantically directed additive application of this rule is thus assured by the maximalization of terminality principle and the phonetically directed deletive application of the rule, since AGENT is not a lexically significant element, also seems to be principled.

What remains to be considered is the obligatoriness-optionality and the directed use of rules that do not involve constant-addition-deletion. There are actually two rules that involve variable-addition-deletion; but since one of these, Pronominalization, has been formulated so as also to add an uninterpretable constant, PRONOUN, this fact, as seen above, determines the obligatory, phonetically directed constant-adding (and variable-reducing) effect of the rule and the semantically directed constant-deleting (and variable-adding) application.[55] Let us now consider the last remaining rule. This rule effects the copying and raising of a

---

[55] The decision to collapse into one rule the variable-addition-deletion and the constant-addition-deletion involved in pronominalization was not arbitrary in that I cannot see how a PRONOUN-addition rule separate from the idempotency rule would be able to delimit the class of constituents that should be added the label PRONOUN to.

noun--or, in reverse, the deletion of a noun under identity. The obligatory phonetically-directed copying effect of this rule I will take to be explained following Sanders (1972a, 107ff), by the fact that such rules if applied as to copy and raise increase the number of parentheses in the representation; and since parentheses are directly converted into ordering relations, the increase of the number of parentheses can be said to feed ordering rules. All in all, these considerations determine the obligatoriness and correct directional use of all six rules which effect, in phonetically terminated derivation, the addition of the constant SUBJECT, OBJECT, PRONOUN, and SHORT, the deletion of the constant AGENT, the pronominalization of identical nouns and the copying and raising of nouns included in verbs: and they determine their oppositive effect in semantically terminated derivations.

Let us now consider the applicational precedence options of the rules. First of all, some of the rules are intrinsically ordered, in the sense that the application of one of them presupposes the prior application of some others. Thus, both Agent Deletion and Object Addition must follow, in phonetically directed derivations, Subject Addition; Pronominalization must follow Raising; and Short Addition must follow Pronominalization. What is not intrinsically determined is the order of Agent Deletion and Object Addition; and the relationship of the sequence Subject Addition followed by Agent Deletion and Object Deletion, on the one hand, and of the sequence Raising, followed by Pronominalization followed by Short Addition, on the other. As far as the ordering of Agent Deletion and Object Addition are concerned, their ordering is empirically insignificant. As far as the applicational precedence relationship of the two sequences is concerned, that, too, is immaterial.

We will now lastly consider applicational options of the type when given a representation, a rule can apply to two different parts of it--or, equivalently, when given a rule and given a representation, two distinct daughter rules can be formulated of the same rule either of which can apply to the representation. The raising rule as formulated is such a rule, in respect to terminal and semantic representations of transitive sentences.

In order for it to account for the maximal number of facts about languages, the use of the Raising rule should be determined as follows:
a. given the kind of terminal semantic representation of transitive sentences that has been hypothesized here, it should be allowed to apply to both nominals under certain conditions; and for a maximum of three times
b. the rule should be made to apply obligatorily for the first time if the nominal is either AGENT, or DEFINITE, or RELEVANT (although it may apply optionally also in the absence of these properties); it should be made to apply obligatorily for the second time if the nominal is either AGENT, or DEFINITE, or RELEVANT (and it must not apply optionally otherwise); and its application should be made optional for the third time, contingent on the property TOPICAL.

Before discussing how such constraints could be imposed upon this rule, let us consider the actual working and the empirical justification of the proposed applications. The applications of the rule could be diagrammatically schematized as follows: (dashed lines indicate alternative groupings)

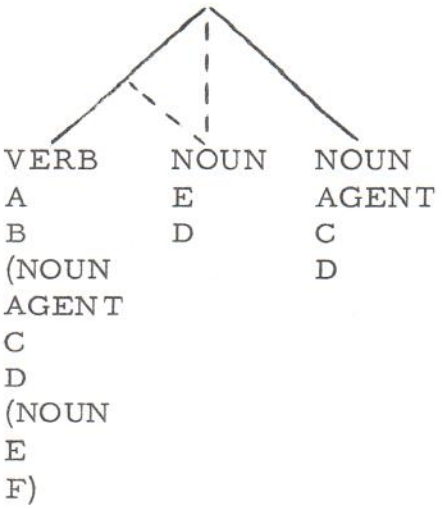
GIVEN: VERB
A
B
(NOUN
AGENT
C
D
(NOUN
E
F

1.a. first application to one nominal:

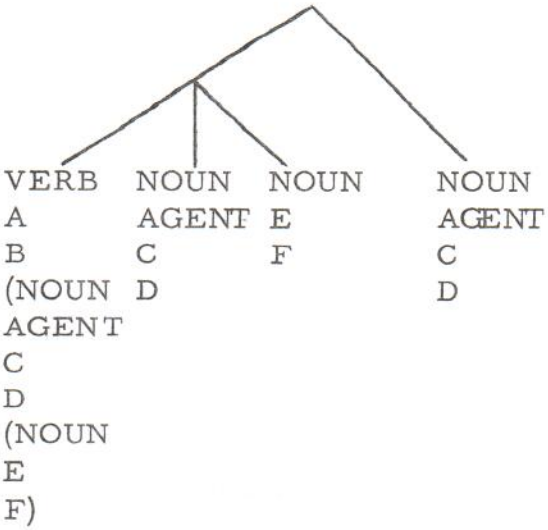
VERB
A
B
(NOUN
AGENT
C
D
(NOUN
E
F)

NOUN
AGENT
C
D

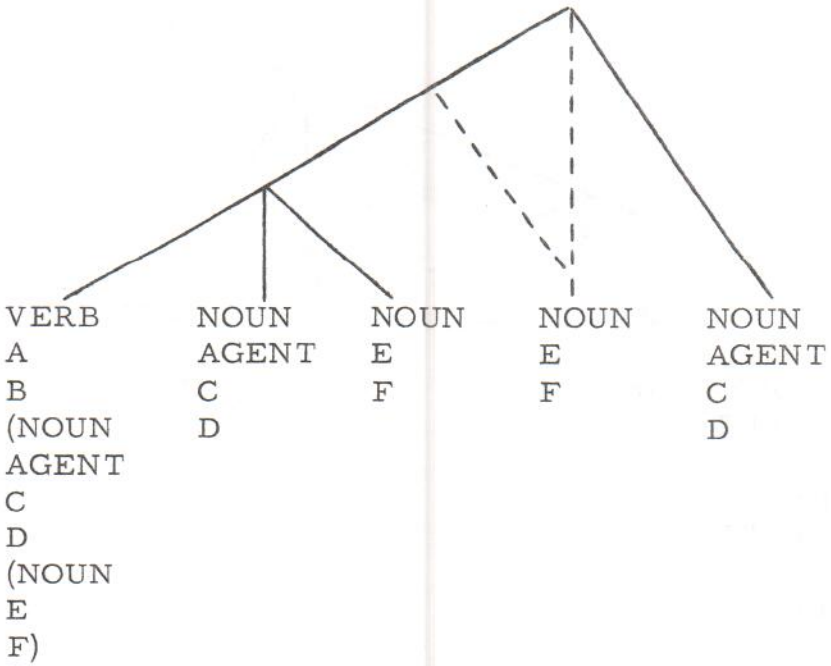
1.b. first application to both nominals:



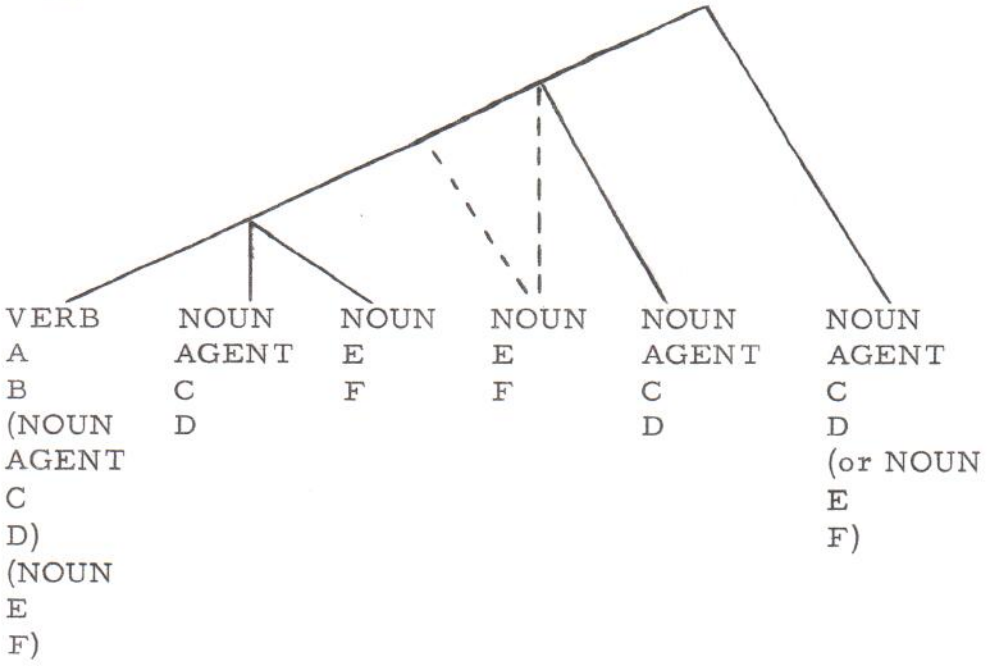
2.a. second application to one nominal:



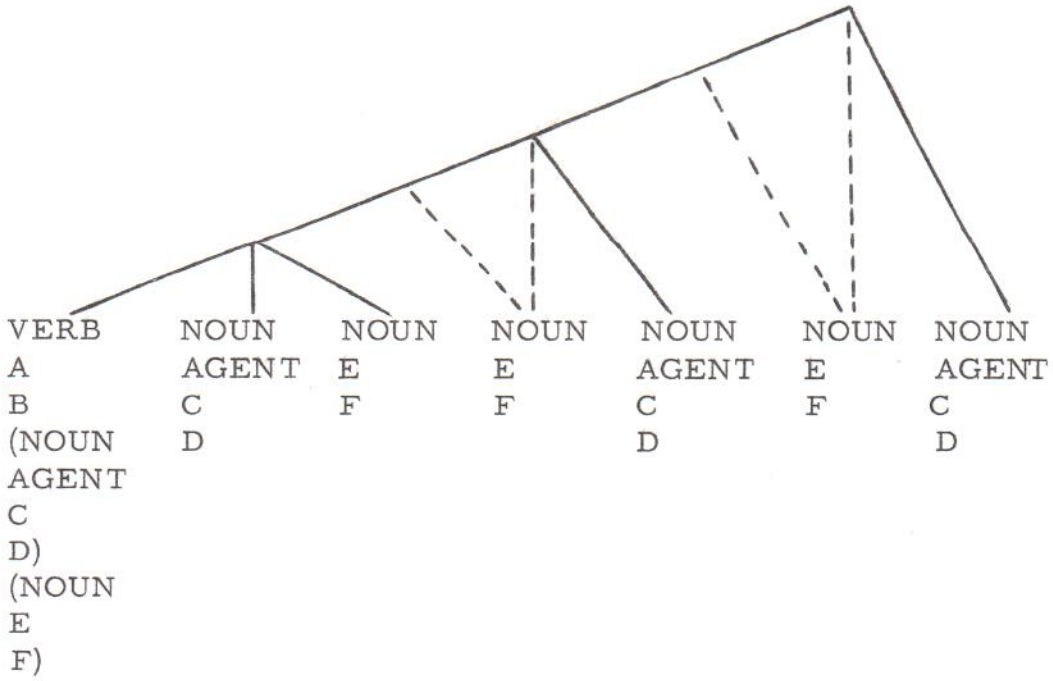
2.b. second application to both nominals:



3.a. third application to one nominal:



3.b. third application to both nominals:



Diagrams 1.a. and 1.b. represent the first application of the raising rule to one or both nominals. This process can account for the fact that verbs and nouns are generally separate lexical constituents and for the fact that the semantic lexical specifications of verbs are best given by the verb including some properties of their potential nominal complements, since the subsequently reduced lower copies of the raised nominals could be taken to account for these nominal properties.[56] Similarly, there is evidence to posit precedence relationships for various kinds of nominals with respect to raising on this level, since, as was pointed out before, whereas objects may be lexically fully included in verbs, subjects may not; and whereas generic or indefinite non-emphatic objects may be lexically fully included in verbs, definite or emphatic ones may not.[57]

Diagrams 2.a. and 2.b. represent the second application of the raising rule to one or both nominals. This process is to account for various facts about verb agreement patterns. It accounts, first of all, for the fact that verb agreement exists; since the subsequently reduced lower copies of the raised nominals constitute natural sources for agreement markers, given the striking pronominal nature of such markers noted in section 1.1.[58] Second, by positing precedential application of the rule to various classes of constituents on this level as well, the attested predictability of some verb agreement patterns from others in various languages stated in the first section of this paper, can be naturally accounted for; in particular, facts like that if in a language the verb agrees with some objects, it also agrees with some subjects; that if it agrees with some indefinite members of a constituent class, it agrees with some definite ones; and that if it agrees with some discourse-irrelevant members of a constituent class, it agrees with some discourse-relevant ones. A further fact that is accounted for by this concept of the

---

[56] Such a suggestion was made in Sanders 1967.

[57] Note also the general observation that verb-noun compounds generally involve the compounding of verbs and generic or indefinite direct objects and perhaps never verbs and subjects. For some "noun-corporating" languages with such object-verb compounds, compare HUNGARIAN, YUCATIC MAYAN, MOHAWK, CHUCKCHEE, for instance.

[58] For the suggestion that agreement should be grammatically represented as an instance of pronominalization, compare, for example, Cowell 1964, Koutsoudas 1967, Sanders 1967, 211-212, Anschen and Schreiber 1968, Givon (in his doctoral thesis), and Hale 1973.

source of agreement is that agreeing nominals, as their ordering patterns indicate, are generally higher nominals of the sentence than non-agreeing ones.[59]

Diagrams 3.a. and 3.b. represent the third application of raising to one or both nominals. This process is to account for dislocated nominals.

The difference between sentences with agreeing objects and sentences with dislocated objects appears not to have been made in the literature; but there is indeed evidence that at least in some languages agreement and dislocation are two separate phenomena. Evidence to indicate this is the fact that at least in some languages an object can be both agreed with and also dislocated within the same sentence. Compare, for instance, HUNGARIAN: a ruhát azt kimosta "the dress-accusative it-accusative cloth-washed-she-it" 'The dress she washed.' (compare kimosta a ruhát "cloth-washed-she-it the dress-accusative" 'She washed the dress.' and kimosott egy ruhát "cloth washed-she a dress-accusative" 'She washed a dress.') In the sentence a ruhát azt kimosta there are, in addition to the object noun itself, and in addition to the implied reference by the lexical form of the verb to the object being cloth, two morphological pronominal representations of the object: one is the verbal suffix -a and the other is the free pronoun azt. Besides the fact that the marker of dislocation is a free pronoun and the marker of agreeement is a suffix, there is also a second difference between the two: whereas the agreement suffix is formally (i.e. intonationally and order-wise) associated with the verb, the dislocation-marking pronoun is intonationally associated with the object. Although I do not have primary evidence from other languages to indicate the object agreement and object dislocation can intrasententially cooccur and are thus distinct, I believe that this is the case for the following reason. Sanders and Tai (1972) suggest that dislocation, which they characterize as involving a sister-to-sentence nominal constituent, is a universal. Some of the languages which are in their sample, however, are languages for which I know that verbs can agree with nominals that are ordered sentence-internally and thus cannot be sisters to the sentence; such as, in addition to HUNGARIAN, MODERN GREEK, ZULU, and SWAHILI. If

---

[59] One set of facts that remains unaccounted for here is the ordering of agreement markers; in particular, the different prelexical representations of the relationship of the verb and the agreement marker. It may be that there are special clitic-ordering rules to account for such facts; for some discussion of such rules, see Perlmutter 1971, Schachter 1973, Sanders 1969.

their observation, according to which these languages have sentences which contain a pronominal reflex in reference to a nominal which is either sentence-initial or sentence-final (but cannot be positioned otherwise) is correct, and if my observation is also correct, that these languages also have sentences which contain a pronominal reflex in reference to a nominal that is not (necessarily) sentence-initial or sentence-final, then it must be that they and I are indeed talking about separate phenomena and that these languages have both object agreement and object dislocation.[60]

All in all, the proposal is that the same raising rule should be used to account for three distinct intra-sententially potentially cooccurring abbreviated reference types to nominal constituents: the intramorphemic reference to them by the lexical form of the verb itself, the agreement marker formally associated with the verb, and the dislocation marker contained in the sentence; in that each of these references are derived from partially reduced copies of raised nominals. Justification for a unified account of the three phenomena of verbal selectional restrictions, agreement, and dislocation was provided by the fact that in each case there is repeated nominal reference involved; that in each case, when one of two nominals has such reference associated with it in the sentence but the other does not, there is evidence both from intonation and from ordering that the referred-to nominal is a higher constituent of the sentence than the nominal not referred to: and that in each case such redundantly referred-to nominals differ from the nominals not so referred to in similar ways. In particular, the precedence-creating nominal features all seem to be interpretable semantic case-functional, referential, or pragmatic properties and in order for it to be further raised and thus agreed-with by the verb, it has to have at least one of the three prop-

---

[60] Sanders and Tai consider, for instance, sentences of LEBANESE ARABIC such as il walad John darabu "the boy John hit-him" (translated by them as 'The boy, John hit him.') as an instance of dislocation; whereas I have considered such LEBANESE sentences as instances of agreement. A piece of empirical evidence which would decide on this would be to test the sentence il walad, John darabu ilu "the boy, John hit-him him" for grammaticality. If this sentence is possible in LEBANESE ARABIC, in the meaning 'The boy, John hit him.' than this sentence will be considered a case of dislocation, with the nominal object being sister to the sentence in prelexical representation, and the other sentence il walad John darabu a case of agreement, with the nominal object being sister to the subject in prelexical representation.

erties: AGENT, DEFINITE, RELEVANT; and in order for a nominal to be raised again, it has to be TOPICAL (which probably implies also DEFINITE and RELEVANT).[61]

Beside these significant similarities of the three phenomena, they are also different in some ways. In particular, there are two things that differentiate intraverbal nominal reference both agreement and dislocation; and there is one thing differentiating each of the latter from the other two. Intraverbal nominal reference differs from both agreement and dislocation in that the nominal features included in the verb are not separately lexicalized; and that the nominal properties involved are all interpretable semantic ones such as AGENT, INSTRUMENT, FEMALE, etc.; as opposed to agreement and dislocation markers which are separate lexical items and which involve interpretable properties such as SUBJECT, OBJECT, NEUTER-GENDER; etc. What differentiates dislocation from both intraverbal nominal reference and agreement is that whereas either one or two (and, in some cases, three) nominal constituents can be referred to intraverbally or by agreement markers, the dislocation of more than one nominals is rare, if existent at all. Finally, the crosslinguistic distribution of these phenomena is such that it differentiates agreement both from intraverbal nominal reference and from dislocation; in that the latter two are probably universal whereas verb agreement is not.

The difference between two synonymous sentences such that one belongs to one language and the other to another language, and such that one shows verb agreement with a nominal constituent and the other does not could in principle be accounted for in four different ways:
a. by difference in lexical rules--i.e. by having two lexical rules in the two languages which differ in that one expresses the equivalence of the semantic properties of the agreement marker and a non-zero phonological constituent and the other expresses equivalence between the

---

[61] The grammatical significance of the animate-inanimate distinction, subject-object distinction, of the definite-indefinite distinction, and of the intrasententially highest-not-highest nominal distinction has been widely observed and the respective precedence of the first member of each of these pairs over the second noted. For subject-object (as well as for precedence relations involving lower constituents), see Keenan and Comrie 1972; for the precedence of definite over indefinite, and of animate over inanimate, nominals, see Clark 1970; for the precedential deletion of intrasententially highest constituents over lower ones, see Sanders and Tai 1972; for the preferential case marking of definite objects over indefinite ones, see Hegedeos 1973.

semantic properties of the agreement marker and a zero phonological constituent

b. by difference in reduction rules--i.e. by positing a pronominalization process for the language with agreement and a deletion process for the language without it, both subsequent to the nominal raising rule

c. by difference in the type of raising process--i.e. by hypothesizing that the language with agreement has a copying rule followed by pronominalization and that the language without agreement has a regrouping rule which raises the original nominal rather than a copy

d. in terms of the hypothesized presence versus absence of a nominal raising process--i.e. by assuming that the language without agreement has no rule effecting the nominals beyond the one that copied them out of the including verb. Sanders and Tai (1972), when considering the similar problem of how to characterize the difference between languages with both object dislocation and topicalization and those with only dislocation of objects decided in favor of a solution of type b.--i.e. to explain the difference by hypothesizing that the former type languages have both pronominalization and deletion processes in relation for non-highest sentence constituents, whereas the latter type only have pronominalization in respect to such constituents; and they were able to provide independent evidence that this is so, in processes other than dislocation and topicalization. In respect to agreement, I do not have any evidence to choose among the four alternatives.

Having considered some evidence for the triple application of the Raising rule that we have posited, we will now turn to the question of how the rule can be made to apply just to those nominals to which there is evidence it applies and with the empirically required obligatoriness or optionality; in particular, that on the level of extraverbal raising it should apply optionally to any nominal and obligatorily to those that are either AGENT, or DEFINITE, or RELEVANT; that is should apply obligatorily on the second level to nominals that are either AGENT, or DEFINITE, or RELEVANT (and it should not apply optionally otherwise); and that it should apply optionally on the third level to nominals that are TOPICAL. Although there is clearly some regularity involved, in that all three applications depend on the same type of interpretable semantic property, and that the lowest-level raising seems to apply to the widest range of nominals, and the highest level raising to the narrowest range of nominals, I cannot find any way of insuring the proper application of the rule other than rule-specifically stating the conditions.

2.5. A fragment of a universal grammar

A fragment of a universal sentence grammar will be presented as a

summary of the preceding discussion, followed by an illustration of its use. Although the rules will constitute a very minute subset of the rules that a reasonably complete universal sentence grammar would have to include, it is clear what subset of those rules the present grammar includes and what it would take to complete it. In particular, the grammar will not include any phonological rules, it will include only a small subset of the syntactic and lexical rules, a small subset of the inference rules, and a reference to only two languages.

The grammar can be used to prove a certain subset of logically possible theorems about one or more sentences of one or more languages. In particular, it can be used to prove equational theorems in general; and it has been meant to be used to prove members of that subset of equational theorems that are bimodal and that include reference to interpretable phonetic variables and to interpretable semantic constants, variables, or both, of one or two sentences. The most elementary of such interpretable bimodal equational theorems are sentencehood theorems; the proofs of all more complex theorems such as entailment, synonymy, contradiction, ambiguity, presupposition, analyticity, and self-contradiction theorems, will always properly include the proof of one or more sentencehood theorems. All sentencehood theorem proofs and thus also all proofs of more complex theorems always properly include proofs of some abstract theorems as well; proofs of agreement theorems, for instance, will always be derivable from corresponding sentencehood proofs.

A theorem is taken to be proven if it can be shown, by using the rules of the grammar, to stand in derivability relationship with one or more idempotency axioms.

The grammar consists of a set of rules some of which are substantive and others inferential. All substantive rules predicate equivalence between two linguistic representations. All substantive rules are either context-sensitive addition-deletions (or redundancy rules), or context-sensitive variable-addition-deletions (or idempotency rules), or context-free or context-sensitive bimodal substitutions. All substantive rules refer either to constants or to variables: the constants are either the interpretable symbolic equivalence sign, or interpretable phonetic property and relation labels, or interpretable semantic property and relation labels, or non-interpretable semantic property labels.

Interpretable elements of this grammar are the following:

a. the equation mark (=)

b. phonetic interpretable elements: relational element: the ampersand (&); property elements: the letters of the alphabet and (stress)

c. semantic interpretable elements: relational element: the comma (,); property elements: VERB, NOUN, PRESENT, DEFINITE, RELEVANT, AGENT, ANIMATE, SPEAKER, ANIMAL, TREAT, BY FIRE, FOOD. It is assumed that all of these elements have explicit interpretations into immediate observations, but these interpretations except for those of the relational terms, are not given here. The interpretations of the relational terms are these: A = B is interpreted as expressing the relationship A and B are "symbolically equivalent", (A, B) expresses the relationship A and B are "cognitively associated", and (A & B) expresses the relationship A "linearly precedes" B.

Uninterpretable elements of this grammar are SUBJECT, OBJECT, PRONOUN, SHORT.

Except for the assumption about sentence domain, which is counter to Sanders' concept of grammar, all of these content-related and formal characteristics of universals grammar have been adopted from Sanders 1967, 1970a, 1972a, 1972c, constituting a small part of the relevant proposals made there.

The particular rules of the grammar are these:

A. Inference rules

1. A rule can apply to a representation if the representation can be analyzed into one of the two sides of the rule.
2. To apply a rule means to substitute a given representation which can be analyzed into one side of the rule by another representation that can be analyzed into the other side of the rule.
3. Use unasterisked rules for proving sentencehood theorems for ENGLISH; use once-asterisked rules for proving theorems for ZULU; use doubly asterisked rules either for ENGLISH or for ZULU.
4. Given a proof, given a rule, and given a representation such that the rule can apply to the representation to directly increase the number of distinct terminal elements in it, the rule must apply and it has to apply only so as to effect this increase. Similarly, if a rule can apply to a representation so as to decrease the number of distinct initial elements in it, it must apply and only so as to effect this decrease.
5. Rule 1.a. applies obligatorily for the first time to any nominal that is either AGENT or DEFINITE or RELEVANT, and optionally to others; for the second time, obligatorily to nominals that are either AGENT or DEFINITE or RELEVANT and not at all to others; and optionally for the third time to nominals that are TOPICAL.

B. Substantive rules

1. Syntactic rules

xx 1.a. ((VERB, X, Y (NOUN, Z)) = ((VERB, X, Y (NOUN, Z)) (NOUN, Z))

1.b. ((VERB, X, Y (NOUN, Z)) = ((VERB, X, Y),(NOUN, Z))

xx 1.c. ((X, Y) (PRONOUN, X) Z) = ((X, Y) (X, Y) Z)

xx 1.d. (NOUN, DEFINITE, X) = ((NOUN, DEFINITE, X),(NOUN, X))

xx 1.e. ((VERB, PRESENT, X) Y) = ((VERB, X),(PRESENT) Y)

x 1.f. ((VERB, SINGLE, X) (PRESENT)) = ((VERB, X),(PRESENT, SINGLE))

xx 1.g. (PRESENT, X),(OBJECT, SHORT, Y) = ((PRESENT, X) (OBJECT, SHORT, Y))

1.h. (PRESENT),(SUBJECT, SHORT, X) = (PRESENT, SUBJECT, SHORT, X)

xx 1.i. AGENT = AGENT, SUBJECT

1.j. SUBJECT = SUBJECT, AGENT

xx 1.k. ((NOUN, SUBJECT, X),(NOUN, -SUBJECT, Y) Z) = (NOUN, SUBJECT, X)

xx 1.l. (((VERB, X),(PRONOUN, Y) Z),(NOUN, W),(NOUN, Q)) = (((VERB, X),(PRONOUN, SHORT, Y) Z),(NOUN, W),(NOUN, Q))

x 1.m. (((VERB, X),(NOUN, Y),(NOUN, Z)),(-NOUN)) = (((VERB, SINGLE, X),(NOUN, Y),(NOUN, Z)),(-NOUN))

2. Lexical rules

2.a. Ordering rules

xx 2.a.a. (DEFINITE, X),(NOUN, X, Y)) = ((DEFINITE, X) & (NOUN, X, Y))

xx 2.a.b. ((PRESENT, X),(OBJECT, Y)) = ((PRESENT, X) & (OBJECT, Y))

x 2.a.c. ((PRESENT),(VERB, X)) = ((PRESENT) & (VERB, X))

2.a.d. ((PRESENT, X),(VERB, Y)) = ((VERB, Y) & (PRESENT, X))

x 2.a.e. ((SUBJECT, X),(OBJECT, Y)) = ((SUBJECT, X) & (OBJECT, Y))

xx 2.a.f. ((SUBJECT, X),(VERB, X)) = ((SUBJECT, X) & (VERB, Y))

2.b. Lexical rules proper

x 2.b.a. NOUN, SUBJECT, DEFINITE, SPEAKER = mina

x 2.b.b. PRESENT, SINGLE = ya

x 2.b.c. VERB, TREAT, BY FIRE (PRONOUN, AGENT)

	(PRONOUN, FOOD) = pheka
x 2.b.d.	NOUN, FOOD, ANIMAL [OBJECT] [RELEVANT] = ama
x 2.b.e.	PRONOUN, DEFINITE, FOOD = iny
x 2.b.f.	PRONOUN, SHORT, SUBJECT, SPEAKER = ngi
x 2.b.g.	PRONOUN, SHORT, OBJECT, FOOD = yi
x 2.b.h.	PRESENT = Ø
x 2.b.i.	NOUN, SUBJECT, SPEAKER, DEFINITE = I
2.b.j.	VERB, TREAT, BY FIRE, AGENT, FOOD = cook
2.b.k.	NOUN, ANIMAL, FOOD = meat
2.b.l.	PRONOUN, DEFINITE = the
2.b.m.	NOUN, PRONOUN, SUBJECT, SPEAKER, PRESENT = Ø
2.b.n.	RELEVANT = stress [62]

([x] is a property whose joint presence with other properties in a constituent is sufficient but not necessary for a rule to apply).

---

[62] The rules as given here are not all appropriately restricted. Note the following:

a. Rule 1.c., the pronominalization rule, is unrestricted in that it may delete any or all identical properties of a constituent. It cannot, however, be used as a deletion rule, since it also involves addition of the label PRONOUN to the reduced constituent. Nothing prevents this rule from producing representations with any "size" pronominal elements and the necessary constraint is provided by the lexicalization rules--that is to say, only those products of the rule will eventually become pronounceable which happen to be matched by a lexical rule of the language.

b. No provision is made to keep the phonetically directed AGENT-deletion, SUBJECT-addition, and PRONOUN-addition rules from operating on nominals included in the verb. This is of course a problem, since these nominal properties are to correspond to verbal selectional restrictions and these are definable in terms of underlying, rather than intermediate, case labels; and there is no point in labelling them pronouns. In the proofs to follow, it will be pretended that the AGENT-SUBJECT substitution does not take place within the verb; but the label PRONOUN will be included in them.

c. No provision is made from keeping 1.d., the determiner-splitting rule, from splitting pronouns.

d. No provision is made to insure that in ENGLISH there is copying and raising on subjects, but regrouping for objects.

The use of these rules will now be illustrated, by proving a sentencehood theorem, a monolingual implication theorem, and a bilingual synonymy theorem.

Theorem I

Is it true that the phonetic string mina inyama ngiyaipheka means in ZULU what the ENGLISH sentence I cook the meat, means? Or, prove the following sentencehood theorem for ZULU: mina inyama ngiyayipheka = (VERB, PRESENT, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER) (NOUN, DEFINITE, RELEVANT, FOOD, ANIMAL)).

Condition of proof: the theorem will be proven if it can be shown to stand in derivability relationship with either of the two idempotency equations:

a. mina inyama ngiyayipheka = mina inyama ngiyayipheka

b. (VERB, PRESENT, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER) (NOUN, DEFINITE, RELEVANT, FOOD, ANIMAL)) = (VERB, PRESENT, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER) (NOUN, DEFINITE, RELEVANT, FOOD, ANIMAL)). The proof below will be phonetically directed and thus in order for the theorem to be proven true the proof should terminate in equation a.

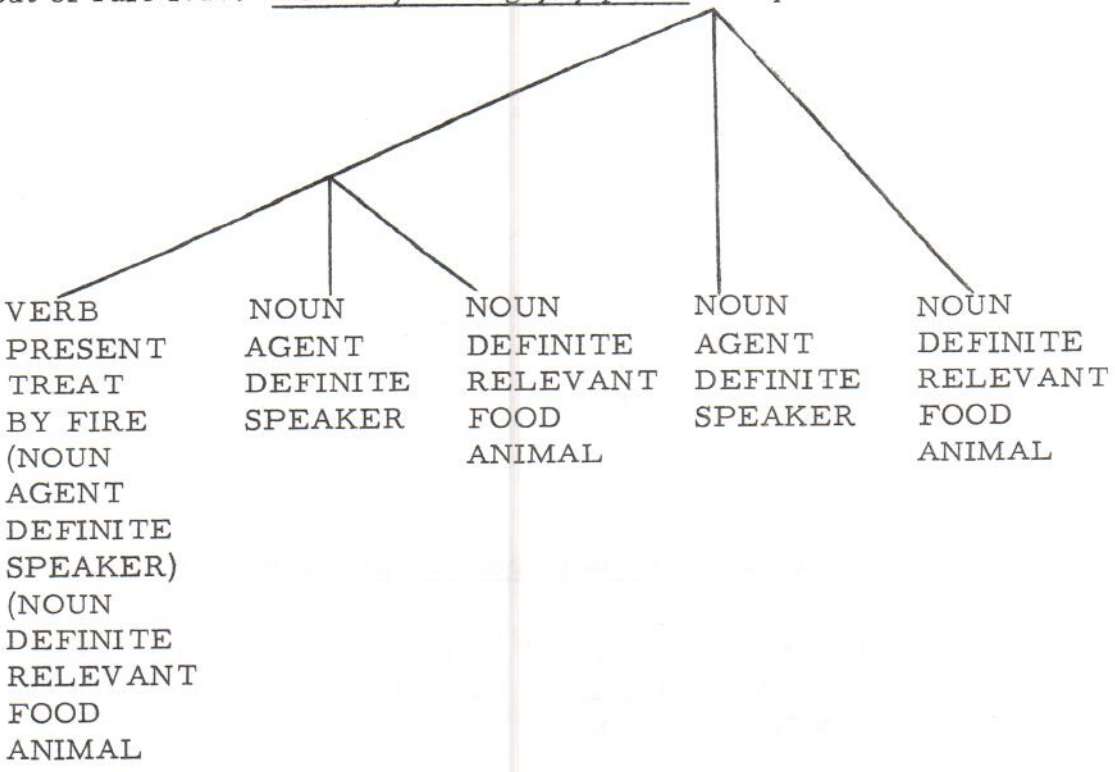
Proof:

Given: mina inyama ngiyayipheka is equivalent to:

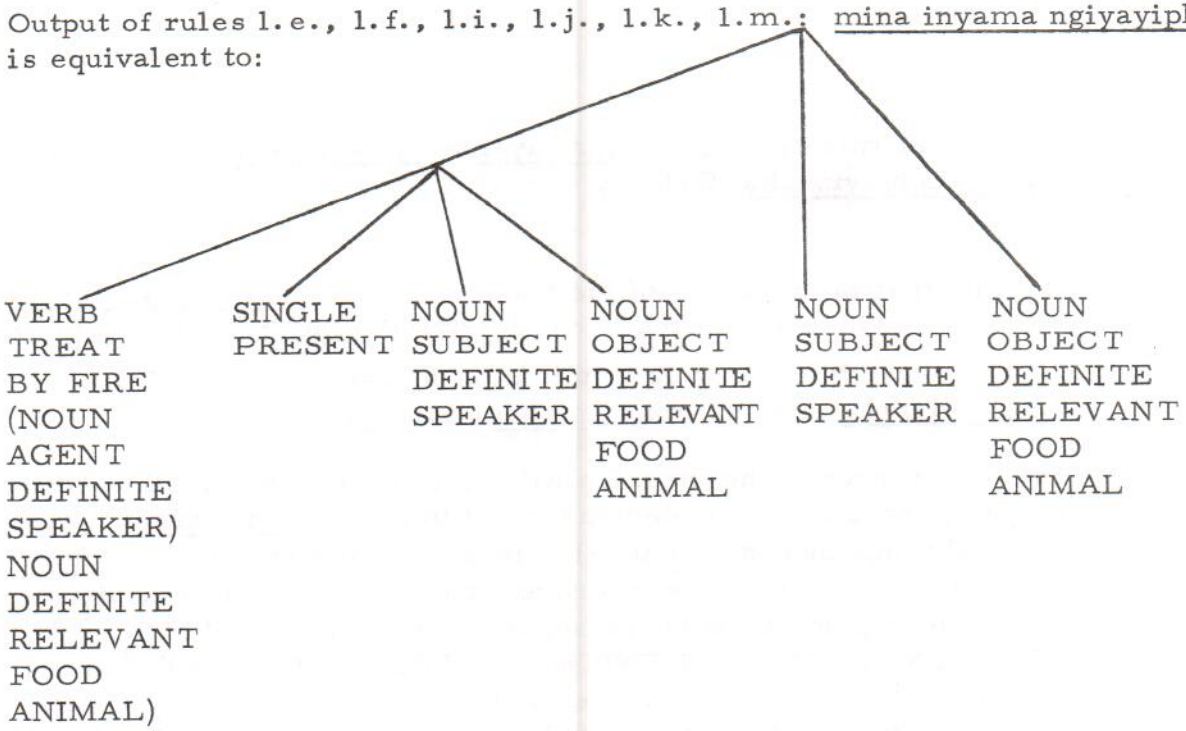
VERB
PRESENT
TREAT
BY FIRE
(NOUN
AGENT
DEFINITE
SPEAKER)
(NOUN
DEFINITE
RELEVANT
FOOD
ANIMAL)

(Footnote 62 continued)
e. I do not know how to make sure that a lexical rule of the type A = Ø is applied in semantically directed derivations (such as rule 2.b.h.). Similarly, I do not know how lexical rules with optional property labels such as 2.b.d. apply in semantically directed derivations.

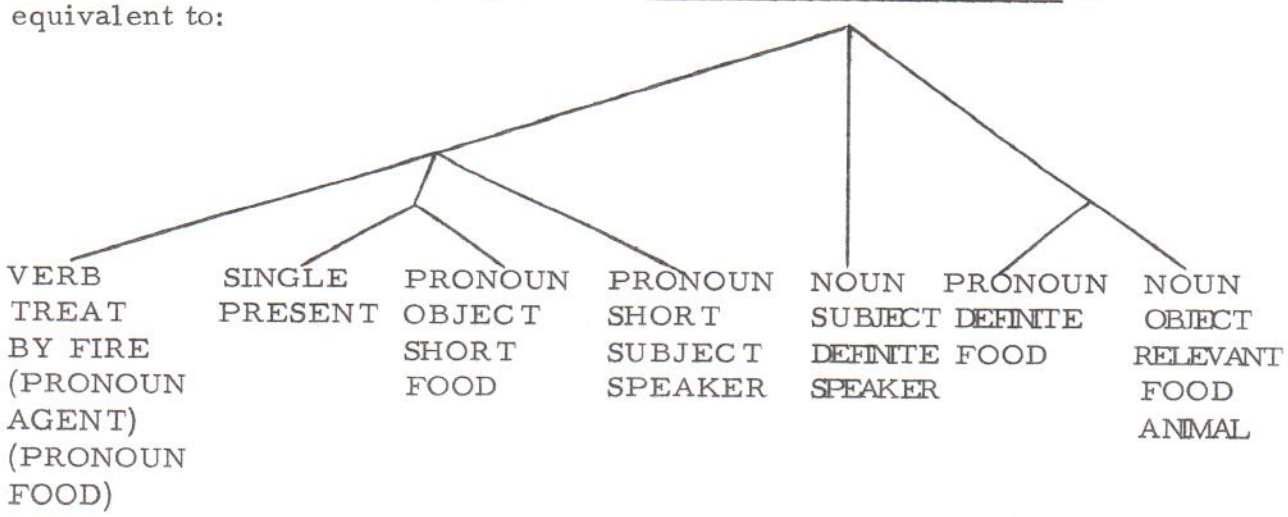
Output of rule 1.a.: mina inyama ngiyayipheka is equivalent to:



Output of rules 1.e., 1.f., 1.i., 1.j., 1.k., 1.m.: mina inyama ngiyayipheka is equivalent to:



Output of rules 1.c., 1.d., 1.g., 1.l.: mina inyama ngiyayipheka is equivalent to:


VERB TREAT BY FIRE (PRONOUN AGENT) (PRONOUN FOOD)
SINGLE PRESENT
PRONOUN OBJECT SHORT FOOD
PRONOUN SHORT SUBJECT SPEAKER
NOUN SUBJECT DEFINITE SPEAKER
PRONOUN DEFINITE FOOD
NOUN OBJECT RELEVANT FOOD ANIMAL

Output of ordering rules: mina inyama ngiyayipheka is equivalent to:

NOUN SUBJECT DEFINITE SPEAKER & PRONOUN DEFINITE FOOD & NOUN OBJECT RELEVANT & PRONOUN SHORT SUBJECT DEFINITE SPEAKER & SINGLE PRESENT & PRONOUN SHORT OBJECT FOOD & VERB TREAT BY FIRE (PRONOUN AGENT (PRONOUN FOOD)

Output of lexical rules proper: mina inyama ngiyayipheka is equivalent to mina inyama ngiyayipheka; Q.E.D.

Theorem II

Is it true that the meaning of the phonetic string mina inyama ngiyayipheka implies the meaning of the phonetic string mina ngipheka inyama in ZULU? Or, prove the following implication theorem for ZULU: mina inyama ngiyayipheka implies mina ngipheka inyama.

Condition of proof: the theorem will be proven if the terminal semantic representation that can be demonstrated to be of mina inyama ngiyayipheka properly includes the terminal semantic representation of mina ngipheka inyama. It has alread been proven that the terminal semantic representation of the purported entailed sentence is (VERB, PERSON, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER) (NOUN, DEFINITE, RELEVANT, FOOD, ANIMAL)). Let us hypothesize that the terminal semantic representation of the purported entailed sentence is (VERB, PRE-

SENT, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER) (NOUN, DEFINITE, FOOD, ANIMAL)). If this were indeed the case, then, since this representation is properly included in the former representation, the theorem were proven. What remains to be done, therefore, is prove the following sentencehood theorem: mina ngipheka inyama = (VERB, PRESENT, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER) (NOUN, DEFINITE, FOOD, ANIMAL)). This will now be proven in a semantically directed proof; so that in order for the theorem to be proven true, the proof must end in the following idempotency equation: (VERB, PRESENT, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER),(NOUN, DEFINITE, FOOD, ANIMAL)) = (VERB, PRESENT, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER),(NOUN, DEFINITE, FOOD, ANIMAL)).

Proof:

Given: (VERB, PRESENT, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER),(NOUN, DEFINITE, FOOD, ANIMAL) is equivalent to mina ngipheka inyama

Output of lexical rules proper: (VERB, PRESENT...) is equivalent to (NOUN, SUBJECT, DEFINITE, SPEAKER) & (PRONOUN, SHORT, SUBEJCT, SPEAKER) & (PRESENT) & VERB, TREAT, BY FIRE (PRONOUN, AGENT) (PRONOUN, FOOD))

Output of ordering rules: (VERB, PRESENT...) is equivalent to ((((VERB, TREAT, BY FIRE, (PRONOUN, AGENT),(PRONOUN, FOOD)),(PRONOUN, SHORT, SUBJECT, DEFINITE, SPEAKER),(PRESENT)),((PRONOUN, DEFINITE, FOOD),(NOUN, OBJECT, ANIMAL, FOOD))),(NOUN, SUBJECT, DEFINITE, SPEAKER))

Output of rules 1.c., 1.d., 1.l.: (VERB, PRESENT...) is equivalent to ((((VERB, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER), (NOUN, DEFINITE, FOOD, ANIMAL)),(NOUN, SUBJECT, DEFINITE, SPEAKER),(NOUN, OBJECT, DEFINITE, FOOD, ANIMAL),(PRESENT)) (NOUN, OBJECT, DEFINITE, FOOD, ANIMAL)),(NOUN, SUBJECT, DEFINITE, SPEAKER))

Output of rules 1.e., 1.i., 1.j., 1.k.: (VERB, PRESENT...) is equivalent to ((((VERB, PRESENT, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER),(NOUN, DEFINITE, FOOD, ANIMAL)),(NOUN, AGENT, DEFINITE, SPEAKER),(NOUN, DEFINITE, FOOD, ANIMAL)),(NOUN, DEFINITE, FOOD, ANIMAL),(NOUN, AGENT, DEFINITE, SPEAKER))

Output of rule 1.a.: (VERB, PRESENT, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER),(NOUN, DEFINITE, FOOD, ANIMAL)) is equivalent

to (VERB, PRESENT, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER), (NOUN, DEFINITE, FOOD, ANIMAL)); Q.E.D.

Theorem III

Is it true that the ZULU phonetic string mina inyama ngiyayipheka and the ENGLISH string I cook the meat. have the same meaning? Or, prove the following synonymy theorem: mina inyama ngiyayipheka in ZULU is synonymous with I cook the meat. in ENGLISH.

Condition of proof: the theorem will be proven if the terminal semantic representation that can be demonstrated to be of the ZULU sentence is the same as the terminal semantic representation that can be demonstrated to be of the ENGLISH sentence. It has already been demonstrated above that the terminal semantic representation of this ZULU sentence is (VERB, PRESENT, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER) (NOUN, DEFINITE, RELEVANT, FOOD, ANIMAL)). If, therefore, it can be proven that this is also the terminal semantic representation of the ENGLISH sentence, the synonymy theorem in question will have been proven. The sentence hood theorem that thus has to be proven will be proven in terms of a phonetically directed proof such that the condition of proof will be that the sentencehood theorem be shown to stand in derivability relationship with the idempotency equation I cook the meat. = I cook the meat.

Proof:

Given: I cook the meat. is equivalent to (VERB, PRESENT, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER),(NOUN, DEFINITE, RELEVANT, FOOD, ANIMAL)).

Output of rules 1.a. and 1.b.: I cook the meat. is equivalent to (((VERB, PRESENT, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER), (NOUN, DEFINITE, RELEVANT, FOOD, ANIMAL)),(NOUN, AGENT, DEFINITE, SPEAKER)),(NOUN, AGENT, DEFINITE, SPEAKER),(NOUN, DEFINITE, RELEVANT, FOOD, ANIMAL))

Output of rules 1.e., 1.i., 1.j., 1.k.: I cook the meat. is equivalent to (((VERB, TREAT, BY FIRE (NOUN, AGENT, DEFINITE, SPEAKER) (NOUN, DEFINITE, RELEVANT, FOOD, ANIMAL)),(PRESENT) (NOUN, SUBJECT, DEFINITE, SPEAKER)),(NOUN, SUBJECT, DEFINITE, SPEAKER),(NOUN, OBJECT, DEFINITE, RELEVANT, FOOD, ANIMAL))

Output of rules 1.c., 1.d., 1.h., 1.l.: I cook the meat is equivalent to (((VERB, TREAT, BY FIRE (PRONOUN, AGENT),(PRONOUN, FOOD)) (PRONOUN, SHORT, SUBJECT, SPEAKER, PRESENT)),(NOUN, SUBJECT, DEFINITE, SPEAKER) ((PRONOUN, DEFINITE),(NOUN, OBJECT, RELEVANT, ANIMAL)))

Output of ordering rules: I cook the meat. is equivalent to (NOUN, SUBJECT, DEFINITE, SPEAKER) & (VERB, TREAT, BY FIRE (PRONOUN, AGENT) (PRONOUN, FOOD)) & (PRONOUN, SHORT, SUBJECT, SPEAKER, PRESENT) & (DEFINITE) & (NOUN, OBJECT, RELEVANT, FOOD, ANIMAL)

Output of lexical rules proper: I cook the meat. is equivalent to I cook the meat.; Q.E.D.

3. Conclusions

Let us now return to the questions raised in the beginning of this paper. Crosslinguistic generalizations of basically three kinds were presented there and then some questions asked about them which gave rise to the subsequent discussion about grammars and in particular about the grammar of agreeing sentences. In particular, it was noted that verb-agreement is a cross-linguistically recurrent but non-universal phenomenon; that the nominal classes in terms of which verb agreement patterns are systematically distributed in various languages are major constituent classes and some of their (probably) pragmatically characterizable subclasses; and that agreement markers--particularly object-verb agreement markers--share form and function with personal pronouns. The questions raised about these statements were about their relationship to immediately observable linguistic reality, their significance, and their explainability. I will now summarize the answers to these questions as they emerge from the preceding discussion.

Since observability in language was assumed to be restricted to phonetic properties and relations, semantic properties and relations, and symbolic equivalences and non-equivalences between sounds and meanings, verb agreement, being not describable solely in such terms, received the characterization of a non-observable, abstract construct of grammar. The informed statement "in this sentence the verb agrees with the direct object" is thus taken to be formalizable as a statement that makes reference to a non-terminal--in particular, to an abstract semantic (immediately) prelexical--representation of the sentence and which says, in particular, that this representation includes an object constituent, a verb constituent, and a third constituent that is associated with the verb, whose

properties include the properties PRONOUN, SHORT, and OBJECT and whose other properties are all identical to properties included in the object constituent. Since verb-agreement representations are abstract in this sense, no statement that makes reference to them can be a direct observation statement about language. It follows therefore that all of our crosslinguistic generalizations made in section 1.1. are abstract, rather than directly observational. This answers the first of our initial questions.

The concept of "significance" was characterized in section 1.2. in respect to direct observation statements about language, by adopting Sanders' contention according to which all statements making mention of the observable sound form and observable meaning of one or two sentences, without mentioning any constant properties of the sound form involved, are significant linguistic observations. A natural extension of this concept is that a non-observational statement about language is considered significant if it is necessary for the demonstration of the truth of true observation statements that are significant in the above sense. Agreement representations, being theoretical constructs, are thus justified to the extent that they are made essential reference to by explanatory principles of the grammar. Although the question of alternative grammars was not seriously raised in this paper and thus necessity for the assumption of agreement representations cannot be claimed, at least the sufficiency of such mediating representations for proving sentencehood theorems has been illustrated. The generalizations about agreement-significant nominal classes can also be called significant in this derivative sense in that they, too, contribute to achieving more generality with respect to the axioms of the grammar. This is because in the absence of systematic precedence relations among constituent classes and subclasses separate grammatical axioms would have to be formulated (or separate inference rules) for each type of verb-agreement in each language, whereas the presence of such systematic precedence relations widely manifested outside the domain of agreement as well should make it possible to formulate general rule-applicational principles to govern the use of an also very general grammatical axiom--even if such principle could not be proposed in this paper. Thirdly, derivative significance can also be claimed for the generalizations about shared form and function for pronouns and agreement markers, since they also contribute to the generality of grammatical axioms in that they make it possible for the same rule to derive pronouns and agreement markers.

I will finally turn to the question of explainability. As noted in section 1.2., a grammar explains certain observations about language. A part of such explanations is the demonstration of the true equivalence of two inter-

pretable heteromodal representations and is effected by a set of explanatory principles. Since intermediate sentence representations are tools of such explanations, they can be justified within the framework of the grammar, but they cannot be explained. Thus, the question "why do some sentences in some languages have agreement representations?" or, equivalently, "why do some sentence derivations have to make use of rules referring to agreement representations?" which are questions about representations and equivalence statements that are axiomatic to the grammar, cannot be explained by the grammar, since an explanation always involves the invoking of some statement more general than the explanandum; and the most general statements of grammar are its axioms. The same holds true for the intragrammatic answerability of the question "why do pronoun and agreement markers share function and form?" since this, too, is a question about a grammatical rule, rather than about primary linguistic data. To the question "why does the existence of verb agreement pattern X in a language imply the existence of verb agreement pattern Y?" can probably be derived from a more general statement grammar-internally, and thus explained, if it is indeed possible to formulate rule-applicational principles which would predict general precedence relations of which those manifested in the domain of agreement are only a special case.

It is hoped that the paper has achieved its stated objective of asking and answering a set of simple but basic questions concerning a cross-linguistically common linguistic phenomenon and that the formal and informal generalizations discussed are indeed appropriate both for providing some explanations for linguistic observations and also for serving as explananda for theories that explain grammars and thus offer higher-level explanations for linguistically significant facts of language.

REFERENCES

Anderson, S. R. 1968. Pro-sentential forms and their implications for English sentence structure. Reproduced by the Indiana Linguistics Club.

_____. 1970. A little light on the role of deep semantic interpretation. NSF Report No. 26, Harvard University, Cambridge, Mass. II.1-II.13.

Anschen, F. and P. A. Schreiber. 1968. A focus transformation of Modern Standard Arabic. Language, 44.4. 792-797.

Babcock, S. S. 1970. The syntax of Spanish reflexive verbs. The parameters of the middle voice. The Hague: Mouton.

Blanc, H. Communal dialects in Bagdad. Harvard Middle Eastern Monographs, X. Cambridge, Mass.

Blansitt, E. L., Jr. 1973. Bitransitive clauses. Working Papers on Language Universals, 13. 1-26.

Clark, E. V. 1970. Locationals: a study of the relations between "existential", "locative", and "possessive" constructions. Working Papers on Language Universals, 3. L1-L37.

Cowell, M. W. 1964. A reference grammar of Syrian Arabic. Washington, D. C.: Georgetown University Press.

Drachman, G. 1970. Copying and order-changing transformations in Modern Greek. Working Papers in Linguistics, 4. 1-30.

Eckman, F. R. 1974. Agentive and agentless passives. Working Papers on Language Universals, 4. 59-74.

Ferguson, C. A. 1970. Grammatical categories in data collection. Working Papers on Language Universals, 4. F1-F15.

Fillmore, C. A. 1966. The case for case. In Bach, E. and R. T. Harms (editors), Universals in linguistic theory. New York, Chicago: Holt, Rinehart and Winston, Inc. 1-88.

Fulass, H. 1971. On Amharic relative clauses. First draft. Manuscript.

Getatchew, H. 1971. The suffix pronouns in Amharic. In Kim, Chin-wu and H. Stahlke (editors), Papers in African Linguistics, Edmonton-Champaigne, Linguistic Research, Inc. 101-111.

Givon, T. 1971. Historical syntax and synchronic morphology: an archaeologist's fieldtrip. Papers from the Seventh Regional Meeting of the Chicago Linguistic Society, Chicago, Illinois, 394-415.

Greenberg, J. H.

_____. 1963. Some universals of grammar with particular reference to the order of meaningful elements. In Greenberg, J. H. (editor), Universals of language. Cambridge, Mass.: The M.I.T. Press, 73-113.

Hale, K. 1973. Person marking in Walbiri. In Anderson, S. R. and P. Kiparsky (editors), A festschrift for Morris Halle, New York, Chicago: Holt, Rinehart and Winston, Inc. 308-344.

Hegedeos, M. 1973. Unmarked direct objects. Manuscript.

Hetzron, R. 1971. Presentative function and presentative movement. Studies in African Linguistics, Supplement 2, 79-105.

_____. 1972. Phonology in syntax. Journal of Linguistics, 8. 251-265.

_____. 1973. Surfacing. Studi Italiani di Linguistica Teorica ed Applicata. II. 1-2. 3-71.

Keenan, E. L. 1969. Adequacy tests for semantic representations of English sentences. Reproduced.

_____. 1972. On semantically based grammars. Linguistic Inquiry, III. 4. 413-462.

_____ and B. Comrie. 1972. Noun phrase accessibility and universal grammar. Reproduced.

Koutsoudas, A. 1967. Doubled nominals in Lebanese. Glossa, 1.1. 33-48.

_____. 1969. Workbook in syntax. New York, St. Louis: McGraw-Hill Book Co.

Kunene, E. 1973. The use of object markers in Zulu. Manuscript.

Lee, P. G. 1969. Do from occur. Working Papers in Linguistics, 3. 1-2. The Ohio State University.

Loogman, A. 1965. Swahili grammar--syntax. Louvain.

McCawley, J. D. 1971. Where do noun phrases come from? In Steinberg, D. D. and L. A. Jakobovits (editors), Semantics. Cambridge University Press. 217-231.

Morgan, J. L. 1972. Verb agreement as a rule of English. In Peranteau, P. M., J. N. Levi, and G. C. Phares (editors), Papers from the Eighth Regional Meeting, Chicago Linguistic Society, Chicago, Ill. 278-286.

Perlmutter, D. M. 1971. Deep and surface structure constraints in syntax. New York, Chicago: Holt, Rinehart, and Winston, Inc.

Ross, J. R. 1972. Act. In Davidson, D. and G. Harman (editors), Semantics of natural language. Dordrecht: Reidel. 70-126.

Salone, S. 1974. Object-marker retention-deletion in Swahili. Manuscript.

Sanders, G. A. 1967. Some general grammatical processes in English. Ph.D. Thesis, Indiana University, manuscript. (Also reproduced by the Indiana Linguistics Club.)

_____. 1969. Invariant ordering. Dittoed.

_____. 1970a. On the natural domain of grammar. Linguistics, 63. 51-123.

_____. 1970b. Constraints on constituent ordering. Papers in Linguistics 2:3, 460-502.

_____. 1972a. Equational grammar. The Hague: Mouton.

_____. 1972b. The simplex-feature hypothesis. Manuscript. (To appear in Glossa.)

_____. 1972c. Linguistically-significant attributes of linguistic objects. In Cohen, D. (editor), Papers from the UWM Linguistics Club, First Annual Symposium on Limiting the Domain of Linguistics, Milwaukee, Wisconsin. 1-36.

_____. 1973. On the exclusion of extrinsic-ordering constraints. Reproduced by the Indiana Linguistics Club.

_____ and J. H.-Y. Tai. 1972. Immediate dominance and identity deletion. Foundations of Language, 8. 161-198.

Schachter, P. 1973. Constraints on clitic order in Tagalog. Parangal Kay Cecilio Lopez, 214-231.

Shopen, T. 1972. Logical equivalence is not semantic equivalence. In Peranteau, P. M., J. N. Levi, and G. C. Phares (editors), Papers from the Eighth Regional Meeting, Chicago Linguistic Society, Chicago, Ill. 340-350.